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Erratum: The article entitled "More Work Urged for Bubble-Memory Development" originally published in JPRS-CST-89-015, 18 Aug 89, under "Computers", incorrectly mentioned "Kbytes" and "Mbytes". The correct forms ("Kbits" and "Mbits") are given in the version republished here under "Microelectronics".

Development of High Tech, Basic Research Explored

40081048 Beijing ZHONGGUO KEJI LUNTAN [FORUM ON SCIENCE AND TECHNOLOGY IN CHINA] in Chinese No 3, May 89 pp 4-5, 7

[Article by Zhu Lilan [2612 7787 5695], Deputy Director, State Scientific and Technological Commission]

[Excerpts] [passage omitted] The new S&T revolution is both a challenge and an opportunity. The challenge for us today is one of system versus system, as well as nation versus nation. We must respond to this historical transformation. Today, it is most important that China's national strategy be constantly perfected in accord with the changed situation, enabling it to ensure that the gross industrial output value will be quadrupled by the end of this century, and guaranteeing that the disparity with the developed countries in the S&T and economic sectors will steadily shrink. Under the circumstances of rapid high technology development, we should, while closely following that development, at the same time ensure that in certain fields breakthroughs are achieved as soon as possible; we should form those high-tech industries of obvious economic benefit, spur the development of the whole national economy and further the build-up of national defense to prevent the gap between China's composite national strength and the developed countries from widening another step further. If we are able to fully exploit this opportunity, to carefully bring into play the advantages of our system, to plan comprehensively, destroy departmental parochialism, clearly define administration levels and handle key problems in an organized manner, we can meet the challenge, occupy a place in high tech sectors and set the foundation for a further closing of the gap across the board.

High-tech research and development, and basic research work are closely related. If China is to occupy a position in world high-tech competition, it must earnestly improve basic research work. At the same time, the development of high tech also constantly gives rise to new topics for basic research, promoting the development of basic research.

[Passage omitted] China's high-tech research and development plan (abbreviated as the 863 Plan) is the pursuit of international high-tech progress. Its principal objectives are not those technologies which today have already entered production internationally, but rather it aims at the high-tech industries of the late 20th Century and early 21st Century. The seven high-tech fields it encompasses have all been repeatedly expounded, proven and selected. The criteria for selection were their social and economic significance, the markets which could be opened up and technological feasibility. The great many technological questions explored by the 863 Plan are all leading-edge fields internationally. There are no ready-made conclusions to abide by, independent research and inquiry is required. This strongly requires applied basic research work to blaze a trail and lead. The specialists from each field are all fully attentive to this issue and in the plan, arrangements were made for applied basic research. For example, in the biological field topics were arranged in three levels as follows: The first level is the research and development of the target product or the cultivation of new breeds; the second level is the completion of that applied basic research required to achieve the target product or the cultivation of new breeds; the third level is the exploratory research into new technologies and new techniques which constitute technology reserves. The funding arrangements are 15, 51, and 34 percent.

In the 863 Plan, basic research work has the following characteristics. 1) A comparison of the applied basic research in 863 with basic research in general: The former has clear objectives in application and effort is put forth in obtaining systematic, regular knowledge of relevant key subjects. Although similar to basic research in that it also pursues systematic knowledge of a research subject, it is also different. This is not so much to say that it is objectives which are dissimilar, as to say that the level of knowledge is different and the research angle is different. 2) In the 863 Plan, basic research in the field of engineering technology has been strengthened, for example, the carrying out of in-depth mechanical and regular research on key and general technologies, functional devices, materials, structural units and technological processes; the carrying out of interdisciplinary, synthetical basic research in order to implement the artificial design of materials, reform and innovation of the structure of new systems. 3) The pursuit of the international standards as put forward in the 863 Plan is active pursuit, not following blindly. Its key is in innovation, therefore, it is necessary to have original thinking and concepts, and it is necessary to have lines of technology and technological processes appropriate to the national circumstances. Only through having very good basic research in engineering science can the pursuit and absorption of the strengths of others and innovation both be elevated. 4) Because financial resources are limited, arrangement of the basic research topics in the 863 Plan is also divided into levels. There are those to be stressed and those to be carried out in a coordinated fashion. With respect to those basic research tasks closely related to the technological realization of strategic objectives, strength has been organized to handle them with emphasis. With regard to that research and inquiry which is characterized by unique and original scientific thought, which provides new theories and new technological approaches, a small amount of S&T capability has been organized to initiate work. For this purpose, a set proportion is allocated from the 863 Plan funding and incorporated into State natural sciences funding. Specialists provide 863 project guidance and participate in project appraisals organized by the foundation. The foundation is responsible for project implementation and inspection.

At a certain level, the 863 Plan is a close combination of science and technology, mutually advancing the opportunities provided, especially the excellent conditions created for promoting the development of the engineering science and engineering technology sectors. The development of high-tech and high-tech industries spurs scientific circles to have more of a technological conceptualization, technological circles to have more of a scientific mind, and causes both sides to delve more deeply into knowledge of practical value after the development of scientific concepts while strengthening a sense of social responsibility. The close cooperation of both sides will promote the integration of the branches of science, the development of new fields and the fusing and diversification of technology. Also, it will introduce advanced technology into even more of today's fields of production while making it feasible to constantly open up new fields.

Prerequisites for High-Technology Development Analyzed

40081047 Taiyuan JISHU JINGJI YU GUANLI YANJIU [TECHNO-ECONOMICS AND MANAGEMENT RESEARCH] in Chinese No 3, Jun 89 pp 3-6

[Article by Zhou Weiyao [07119 3634 1031]: "High Technology and the Development of China's Economy"]

[Excerpts] The high-technology revolution has now enveloped the world, and the high technology competition is highly intense. The United States, Japan, the Soviet Union and the developing countries are organizing for the world new-technology revolution. Such activities as the U.S. Star Wars strategic defense program, the European Community's Eureka program, the Soviet-led CEMA integrated science and technology development program for the year 2000, Japan's high-technology development program, and the United Kingdom's information technology program are springing up in profusion everywhere.

The emergence of these high-technology research and development programs abroad indicates that the world revolution in new technology has entered a new stage. For China, this is an important new international trend that must be faced squarely.

China's economic vitalization must rely on high technology: this is an important and realistic strategic problem and we must analyze it with care and adopt an effective policy on it.

3. Reform, Opening, and China's High-Technology Development

At present, China's most important policies are reform and opening; their implementation will put an end to the long-standing closed character of Chinese society, and the policy of opening up will enable us to gain a vantage point that will help to expand our field of vision liberate our conceptions, which is essential if we are to participate in the worldwide high-technology competition. We therefore believe that aspects of the policy of opening and taking part in the worldwide high-technology competition should be accorded major importance.

First, we must reform the frame of reference that we use for comparison and expand our spatial conceptions. The world high-technology competition and the extremely rapid economic and social development indicate that there is a change in the frame of reference in people's thinking, especially among the leaders of the various departments and enterprises. It has specific expressions. The first is a changeover from exclusive concern with vertical comparisons to a focus on horizontal comparisons and a combination of both emphases, forming a complete system of coordinates. In the past, the frame of reference of our departments and enterprises was confined to themselves and to comparing the present with the past. If we take the most advanced domestic and foreign levels in the same industries as a frame of reference, we will discover our own correct position in the system of coordinates, which will enable us to develop a goal-directed strategy for future high-technology development and to identify the steps that need to be taken, so that we gradually approach and, catch up with and surpass the domestic and foreign state of the art. The second expression is a changeover from closedness to openness, expansion of our field of vision to include the world, and engaging in all kinds of observations and considerations: this is a change of spatial conceptions. When the central authorities enunciated the policy of opening to the outside, its intent was to end China's long-standing closed character and self-absorption. The result of this long closedness was a lack of progress-mindedness, a contentment with the status quo, and closed conceptions, so that we had little perceptiveness when faced with the ever-changing new situation and new developments. Leaders should have "all-direction antennas," their field of vision should scan over 360 degrees, and their eyes should have a "double focus": they must use a telescope to get a macroscopic view of the domestic and foreign situation and its trends, and also a microscope to peer into the internal circumstances of their subordinate departments and enterprises so that they can come up with timely science policies that adapt to complex circumstances.

In addition, we must inculcate system concepts. Modernization is an immense system project, and system engineering is a technical science concerned with organization and leadership that has come into being concurrently with the new-technology revolution.

The modernized economy is a multidimensional, multivariate, multileveled, and multifactor three-dimensional network system with both vertical and horizontal dimensions and with extremely complex overlapping effects. In vertical terms, the modern economy includes market forecasting, scientific research, technology development, product development, factory production, storage and transport, marketing through channels, market services

and the like, and all links are interconnected and interrelated; it is both a scientific research cycle from technology to technology and an economic cycle from market to market. The interactions between all links and all factors constitute the functioning of the system.

In horizontal terms, the modern economy not only is interrelated with technology, production and markets, but also with ecology, the environment, population, and social development, and with high technology. As a result, problems cannot be solved in terms of a single objective or a single factor: we must establish an integrated system of development objectives so that science and technology, the economy, management and society develop in coordinated fashion.

From the system standpoint, China's current economic system reform needs to organize all instruments, stages and levels of the management system, the economic structure, and regulatory measures more completely into a rational structure so that they will function as an integrated system, this more effectively promoting the general objective of the development of productive forces. As a consequence, we must establish specialized, sector-specific system research departments and automated information system networks and establish flexible dynamic system images of the relevant type in computer data in order to provide modern technological instruments for high-efficiency, high-speed organization, command, adjustment and control.

4. China's High-Technology Development Policy

How are we to develop a Chinese-style high technology? We cannot follow the Western military technology-driven route. Proceeding in terms of China's circumstances, advantages and practical achievements, we must adopt the following principles.

First, we must minimize investments; second, we must make the cycles as short as possible; third, we must rely more on theoretical research than on experimentation. The focus should be on such matters as: integrated biological effects optimization technology; high-conversion-rate functional technology; integrated treatment technology for enigmatic symptoms, and the like. With regard to such fields as space flight, computers, lasers and microelectronics, which are relatively mature abroad, we must import the latest models and take the approach of studying, using, improving and innovating, so that foreign high technology is assimilated to China and put to our own uses. The process of absorption, assimilation, integration and innovation is like a series circuit, which will not work if one element is missing. Fourth, we must strengthen horizontal technical, economic and social ties between advanced schools and academies, scientific research institutes and the industrial sphere. Fifth, we must establish a small number of compact high-technology development zones and science and industry parks with superior basic facilities in order to create a special technology-intensive, talent-intensive, information-intensive environment.

Impact of "Spark Plan" Assessed

40080226c Beijing ZHONGGUO KEJI LUNTAN [FORUM OF SCIENCE AND TECHNOLOGY IN CHINA] in Chinese No 4, 18 Jul 89 pp 47-50

[Article by Cao Hengzhong [2580 1854 1813] and Li Shizhu [2621 4258 2691]: "Evaluating the Results of Implementing the 'Spark Plan' and Research on Its Development Countermeasures"]

[Text] How are the results from implementing the "Spark Plan," whose goal is invigorating the rural economy, over the past 3-plus years? How can we raise the implementation level of the "Spark Plan" further? To answer this question, the China Science and Technology Promotion and Development Research Center organized some research personnel in 1988 to undertake research work to evaluate the implementation results of the "Spark Plan." During the research process, we resolutely integrated theoretical analysis with actual surveys and did a representative survey of over 20 industrial technology projects in Jiangsu Province, seven resource development projects in Hunjiang City, Jilin Province, and five agro-industrial technology development projects in Hebei Province, and we did a sample survey of over 90 finished and operating projects in Jiangsu Province. On this foundation, we applied scientific methods and modern scientific tools for more detailed analysis and processing.

I. Achievements and Experiences

The "Spark Plan" has been implemented for more than 3 years. It is progressing smoothly and preliminary accomplishments are being seen.

1. A situation of full social concern and promotion of the "Spark Plan" has formed.

After the "Spark Plan" was proposed in 1985, it received consideration and support from State Council leaders and was included in the Seventh 5-Year Plan. The China Agricultural Bank and the Industrial and Commercial Bank provided substantial capital assistance. The Agricultural Bank alone provided 500 million loans in 1986 and 700 million loans [as published] in 1987. Tax departments have actively provided tax exemptions for the projects. National level projects are basically exempt from product taxes and value added taxes for 3 years, provincial (municipal) level projects are exempt for 2 years, and prefecture level projects are exempt for 1 year. Many local governments have focused on implementing the "Spark Plan" as a major affair and many S&T personnel are actively entering "Spark Plan" technical development work. In addition, the "Spark Plan" also has received attention from the United Nations and several Western European nations. The United Nations plans to provide $110 million in loan support for the first period.

2. We have developed several "short, smooth, and fast" technologies and created many famous, special, and superior products, achieving excellent economic, social, and ecological results.

China arranged over 4,000 "Spark" projects in 1986 and 63 percent of them had been completed by early 1988. Incomplete statistics from relevant departments show that these projects added 7.67 billion yuan in value of output through 1988, 1.6 times the investment input, and produced an additional 1.8 billion yuan in profits and taxes. In this way, the entire investment in these projects can be recovered in under 3 years. China arranged over 4,600 "Spark" projects in 1987 and projections are that after all these projects are completed, the added value of output may reach 16 billion yuan with an additional 3 billion-plus yuan in new profits and taxes. Many projects have exported and earned foreign exchange. The sample survey shows that 30 percent of the products in Jiangsu Province's "Spark" projects have received superior national classifications and 30 percent of the products have been appraised as superior new products at the provincial and municipal levels. The sample survey of "Spark" projects in Jiangsu Province shows that "Spark" projects cause little environmental pollution and no resource destruction. Some projects also have played roles in protecting resources and the ecological environment.

3. We have initially opened up funding channels and gradually stabilized capital sources.

Banks, financial administrations, and other departments have provided significant support in obtaining "Spark" capital. This is particularly true for several provinces (and municipalities) which have established "Spark Development Funds" to provide more reliable funding guarantees for the "Spark Plan."

Statistics from relevant departments show total investments of 2.38 billion yuan in "Spark" projects in 1986 and 2.51 billion yuan in 1987, with enterprises raising more than 50 percent themselves. Credit funds accounted for 32 percent of total investments in "Spark" projects in 1986. In a situation of shrinking credit in 1987, this proportion instead rose to 40 percent. This shows that the projects themselves had rather good results and that finance departments have given special consideration to the "Spark Plan."

4. Several new industries which can promote a takeoff in regional economies have appeared, and they have formed a multitude of leading high quality products and industrial development groups which are embodied in integrated scientific research units and key enterprises. These enterprises have moved up to a new stage in the development of scale economies.

5. We have trained many skilled personnel who understand technology and know how to manage and we have developed several "Spark" facilities which use their personnel and facilities to promote development of the rural economy.

6. We have achieved preliminary perfection in "Spark Plan" policy systems and formed rather strong policy support.

7. Many localities have established basic level S&T information networks.

During the process of implementing the "Spark Plan" over more than 3 years, administrative departments at all levels have had similar experiences. One thing is that they conscientiously did good discussion work to prepare for "Spark" projects, which was the key to project success. Second, local leaders came out and led the way with multilateral coordination of banking, taxation, planning commission, financial, agricultural committees, and other departments. This is an effective guarantee for smooth implementation of the "Spark Plan." Third, horizontal integration to establish enterprise groups is an effective form for disseminating technology, carrying along related enterprises, and promoting "a single spark starting a prairie fire." Four, attention to full integration in technical development by organizing a fully integrated development project is an effective way to increase macro results. Five, supporting the state, localities, and enterprises in making matching investments and establishing "Spark" development funds provides the "Spark Plan" with more stable and reliable funding channels.

II. Issues and Problems

1. It still is rather hard to implement "Spark" project funding.

Capital is the financial guarantee for project implementation. Without funds, there basically is no way to implement a project. Although funding source channels for "Spark" projects have basically been opened up, actual implementation is still rather difficult. The main reason is that all funding needs for "Spark" projects come from bank loans, whether matching funds from the state, localities, and enterprises or raised by enterprises themselves. Because project loans were not included in overall credit plans of the People's Bank of China, actual implementation requires a great deal of work. It is manifested in loans allocated by the State Science and Technology Commission as quotas and not as indices. The scale and indices arranged by all the specialized banks are very small. This forces basic level banks to resort to using other directive indices to squeeze out some support for the "Spark Plan." When credit is short, however, implementation of loan quotas becomes extremely difficult.

2. Fund utilization structures are not very rational.

In "Spark" project fund utilization, a too low proportion of research and experiment funds and a too high proportion for technical transformation, capital construction, and other productive expenditures can be found in all areas. A survey of three mountain regions in Fusong County, Hunjiang City which participated in development and processing projects showed that Changbai

Shan actually invested 1.21 million yuan in capital to protect the project, including materials costs of 725,000 yuan, equal to 60 percent. Expenditures on mountain region participation in base area construction were 285,000 yuan, equal to 24 percent. Experiment costs, spark training funds, and other related expenditures were 200,000 yuan, equal to 16 percent. Changbai Shan's Hong participated in a preliminary processing project in which the total investment of 480,000 yuan went to buy productive fixed assets. In another example, Changbai Shan's Hong participated in an intensive processing project with a total investment of 2.9 million yuan, including 1 million yuan spent on preliminary processing equipment used by 10 people in the county, 30,000 yuan in technology expenditures, 1.37 million yuan for equipment purchase costs, 100,000 yuan for transport and installation costs, and 400,000 yuan for capital construction expenditures. The proportion of productive investments is rather large in the fund utilization structure of these projects, while that for research and experiment expenditures is rather low.

3. Agricultural projects involve long schedules and have a poor capacity for recovering funds, so units which undertake them have a rather heavy responsibility.

In mountain region participation in a resource protection project in Fusong County, Hunjiang City, preliminary estimates show that the small mountain region saw increased prosperity after 1 to 2 years of small mountain region participation, while transplanted mountain region participation required about 7 years and a wild seed planting mountain region participation took about 17 years to produce results. This lags quite far behind "Spark Plan" requirements of going into operation in 1 year, making loan payments in 2 years, and complete repayment in 3 years. Generally speaking, agricultural technology development projects (cropping and breeding) take a long time to produce results and are slow to recover the capital. However, this class of projects has incomparable advantages compared to industrial projects, and they play an extremely important role in rural economic development, so they should continue to be a focal point of the "Spark Plan."

4. The depth of technical development is rather low.

A low depth of technical development as used here does not mean that technical levels developed in the "Spark Plan" themselves are too low. Actually, enterprises have developed several famous and superior products at advanced levels within China by undertaking "Spark" projects. This shows that the level of these technologies themselves is not low. However, most of these technologies were not developed during the process of implementing the "Spark Plan." Instead, the limited testing, intermediate testing, and trial manufacture stages were completed prior to project establishment, so the technologies were already somewhat mature. After inclusion into the "Spark Plan" they simply focused on inputs to produce them in large quantities. This changed a "technology development plan" into a "new product operationalization subsidy plan." Generally speaking, helping these projects get started naturally played a definite role in promoting the rural economy. Actually, however, enterprises would still have required these projects and could have moved forward with them even if they had not been included in plans. Moreover, shifting the focus of work from technical development to mainly using capital to aid operationalization also is another advantage of the purposes of the "Spark Plan" and the State Science and Technology Commission itself.

5. The momentum of a "starting a prairie fire" is far from forming.

Technology dissemination in agricultural projects (breeding and cropping) covers a rather broad area. There are more problems with "starting a prairie fire" in industrial technology projects. Excluding some medium-sized and small state-run enterprises which "started a prairie fire" via projects they undertook, township and town enterprise projects lag far behind. The main reasons for the inability for township and town enterprises to "start a prairie fire" are: 1) The time of project completion itself is rather short, so there is no time to work in this area. 2) Basic level science and technology commissions have not given sufficient attention to "starting a prairie fire" and have not included it in the order of the day. 3) Units which assume responsibility have a tendency toward technology monopolization. 4) There is still no policy system to encourage technology dissemination and promote "a single spark starting a prairie fire."

6. The role of local science and technology commissions in using S&T to support township and town enterprises has still not been manifested.

Because of the relative difficulty in fund implementation, the work focus of many local science and technology commissions now is on fighting for funds. Although this plays an important role in smooth project implementation, the advantages of science and technology commissions have never been used. Science and technology commissions are S&T management departments responsible for administering local S&T staffs and scientific research achievements. Moreover, science and technology commission departments themselves have rather high S&T intellectual attainments and should focus their work on helping township and town enterprises develop technology and provide technical consulting, technical services, and other areas to establish bridges between S&T personnel and township and town enterprises. Although work in basic level science and technology commissions does focus on township and town enterprises at this time, they emphasize project establishment and implementation as the core but ignore inputs of S&T achievements and S&T personnel.

III. Preliminary Ideas for Raising the "Spark Plan" to a New Level

1. Focus on raising technical development levels and disseminating "Spark" technologies.

There are three stages in the implementation process for a "Spark" technology development project. They are the research and trial manufacture stage (from limited testing up to intermediate testing), the construction and operationalization stage (producing products), and the dissemination stage (disseminating technologies to other enterprises). The first stage determines the level of the product technologies themselves and requires more technology inputs. This is rather hard for township and town enterprises. Local science and technology commissions have advantages in precisely this area and should actively increase their support. They also should think of ways to act as go-betweens and bridges between enterprises and S&T circles. The second stage requires fewer technological inputs and more capital inputs. This problem faces normal enterprises in developing production. If the first stage is sufficiently successful, township and town enterprises would have a very strong motive power for operationalization and science and technology commissions would merely have to provide coordination to put them into operation. Work in the third stage has certain advantages for the responsible units but if not handled well they can increase enterprise counterparts in competition. Thus, science and technology commissions should make a major effort to guide and intervene.

Local science and technology commissions should focus their work on grasping these two aspects. Besides this, work for technology development and "starting a prairie fire" is a weak link, so we should concentrate our forces on these two stages. This is necessary for further development of science and technology commissions and is within the power of science and technology commission personnel.

2. Strengthen regional development.

In mountainous regions, for example, we should spread development and "Spark" dense regional construction, establish several economic model villages and small industrial region towns to increase their demonstration and radiating capacity for surrounding regions.

Economic development in one region is not simply implementation of some projects but instead requires comprehensive planning and integrated development. Within a single region, increasing the degree of "Spark" integration inevitably enables production of systematic comprehensive effects. No single project can have a comparable demonstration role and radiative capacity for comprehensive economic development in the surrounding region. Moreover, the appearance of several small towns will open a new route for construction of socialist modernized rural areas.

3. Use training and facility development as two wings, use personnel and facilities to promote rural economic development.

4. Encourage scientific research units to undertake "Spark Plan" projects and raise technical development levels.

The pattern now used for "Spark Plan" industrial project implementation is "enterprise responsibility, scientific research units as the technical foundation." This is a good way to promote integration of enterprises with scientific research units, but it has not given full play to the initiative of scientific research units. To raise technical development levels, we propose that a certain proportion be marked out in the "Spark Plan" to adopt an arrangement of "responsibility by scientific research units, township and town enterprises as the production foundation." There are prior examples of this arrangement with very good results.

Adopting these organizational arrangements leads to high project technical development levels and guaranteed technology dissemination because scientific research units can continually develop new products while feeling a sense of detachment from competition in production.

5. Establish a "Spark" S&T information network from top to bottom and link together enterprises and scientific research units as one focus of work in the "Spark Plan."

Local science and technology commissions should use their own S&T advantages to organize scientific research units to undertake technical consulting, technical services, product development, and other work for enterprises to give enterprises stronger technical reserves and reverse the blind situation when township and town enterprises are seeking technologies and products by comparing multiple programs and making scientific selections.

6. Give equal treatment to disseminating existing technologies and disseminating old technologies which still have certain markets, and give equal treatment to disseminating existing technologies and utilizing expert cooperation in production to carry along other enterprises. These are three routes for "a single spark starting a prairie fire."

After enterprises which undertake projects develop new products, they can disseminate their original old products and technologies which have certain markets, or after starting production of a new product, they can use specialized coordination to carry along several township and town enterprises. In this way, project implementation will affect other enterprises, so these are two important patterns for "a single spark starting a prairie fire."

7. Maintain and gradually increase the proportion of state-run enterprises which undertake "Spark" projects and increase the radiative capacity of "Spark" projects.

The representative survey and sample survey showed that most enterprises which had done better in work to disseminate and carry along were urban state-run medium-sized and small enterprises and county-operated state-run enterprises. For example, Changzhou Jintan Textile Machinery Plant and Nantong Dongsheng Chemical Plant are county-run enterprises. Changzhou Electronic Instruments Plant is an urban state-run enterprise. These are rather strong enterprises and have a high development success rate. They have a rather strong capacity for dissemination and carrying along and rather obvious advantages in the trend toward organizing enterprise groups. Thus, we propose that specific proportions be set aside in the "Spark Plan" to implement "responsibility by state-run enterprises, integration with township and town enterprises." This would permit a specific proportion of state-run enterprises to undertake "Spark" projects. At the same time, it can be stipulated that even state-run enterprises which undertake a project must carry along a certain number of township and town enterprises or disseminate technologies to a certain number of township and town enterprises. This stipulation should be included in the contract and fixed in legal form.

8. The People's Bank of China should include S&T loans (including the "Spark Plan") in state comprehensive credit plans to provide a reliable guarantee for credit capital for the "Spark Plan."

Including S&T loans (including the "Spark Plan") in state comprehensive credit plans provides a reliable guarantee for "Spark Plan" credit funds, and it can reduce the work load of science and technology commissions at all levels. At the same time, given the effects of technology development projects in opening market processes in production specialization, the investment environment, the process of developing the technologies themselves, and other factors and the risks created, we propose that the People's Bank of China establish an S&T risk credit fund to protect the initiative of local banks in providing loans to the S&T realm and the production realm.

Lessons Drawn From the Selection of Key Technologies

40080226b Beijing ZHONGGUO KEJI LUNTAN [FORUM OF SCIENCE AND TECHNOLOGY IN CHINA] in Chinese No 4, 18 Jul 89 pp 5-7

[Article by the "Rely on S&T Progress To Optimize Industrial Structures" Topical Group: "Experiences and Lessons in Selecting Major Technologies in China"]

[Text] On 26 September 1988, the State Council Economic, Technological, and Social Development Research Center and the State Science and Technology Commission Research Center invited Wu Mingyu [0702 2494 3842], Lin Zixin [2651 5261 2450], Wu Wufeng [0702 2976 1409], Jin Luzhong [6855 1462 1813], Deng Yumin [6772 5940 3046], Xu Jian [1776 4675], Fu Lixun [0265 4539 8113], and other comrades responsible for guiding work in the State Science and Technology Commission and Chinese Academy of Sciences to sit down and discuss China's experiences and lessons in major technology selection and technological development. At the meeting, these comrades used their own background and a wealth of data to describe the history of S&T development in China and our successes and failures in selecting technologies since the nation was founded. Their speeches are quite valuable as references and are summarized below.

I. The Guiding Role of China's S&T Plans in S&T Development and Technological Selection Since the Nation Was Founded

There has been very little research on the issue of technological selection on a national scale since the founding of the nation. Technology selections are mainly embodied in a series of S&T plans. Beginning in 1956, China formulated three S&T development plans. They are the "Long-Range Plan for S&T Development, 1956-1967" (a 12-year plan), the "S&T Development Plan, 1963-1972" (a 10-year plan), and the "National S&T Development Plan, 1978-1985" (an 8-year plan). The "12-year plan" was completed ahead of schedule, implementation of the "10-year plan" was interrupted by the "great cultural revolution," and the third plan was never actually implemented.

Some comrades feel that these three plans have played an important role in China's S&T development, but most comrades feel that each plan played different roles. Everyone is unanimous that the "12-year plan" played the greatest role since the nation was founded. One thing was its limited goals focused on strategic military weapons. Six urgent measures were adopted and obvious achievements were made. The second thing was that it imported many new scientific ideas of the period and renovated the content of many disciplines in China. Its inadequacies were that it gave greater consideration to integration of technology and the military and neglected integration of technology and the economy. Everyone felt that the real role of the "10-year plan" was the "nine big types of equipment," the "ten great formworks," and so on, whereas the full discipline plan they compiled played only a minor role. Everyone felt that the positive role of the "8-year plan" was simply that it renewed everyone's knowledge of the importance of S&T, but its actual results were not significant since it was never actually implemented.

II. Experiences and Lessons From China's S&T Development and Technology Selections

1. Strategic errors in S&T development. Most comrades attending the meeting felt that S&T work in China has mainly focused on the two goals of "national defense" and "catching up and surpassing" for a long time. The main criterion was successful development of the "two

bombs [atomic and hydrogen] and the satellite." However, it should be noted that "catching up and surpassing" as an S&T development goal had defects. First, science and technology are means, not goals, so technological development should serve economic construction. Thus, it is inappropriate to make "catching up and surpassing" a development goal. Second, the idea of "catching up and surpassing" is not very realistic. Development experiences in Japan, South Korea, and other countries and regions show that late-developing countries, particularly the non-developed nations, find it very hard to catch up with the developed nations within a short time and can only adopt strategic choices which maintain or reduce the discrepancy. China's foundation is weak, so talk of "catching up and surpassing" actually is unrealistic and can only lead to enormous waste. The facts have proven this point. Some comrades have intensively analyzed the causes behind the "catching up and surpassing" strategy. From the perspective of understandings, there are three points. One is that the focal can carry along the general and the incisive can carry along the basic, so we can only place our hopes on the focal and incisive. A typical example is construction of a high energy accelerator. The second point is the feeling that technology faces enormous challenges and that grasping a few advanced technologies can solve major problems. The typical example in this is that success with hydromagnetic power generation technologies will solve China's power shortage problems. The third point is that technology is something which provides big profits with little or no capital, which ignores the role of capital. Seemingly, technology would not require many investments but can produce substantial benefits. This shows an excessively high estimation of the role of technological progress.

2. Mistakes in technology selection and development. Many comrades said that China's S&T already has a substantial level since we have successfully launched satellites and detonated atomic and hydrogen bombs, but the overall level of national income is very low. Although we have grasped some high and new technologies, very few were actually converted to products or could compete internationally. The reasons for this situation are, first, that very little of our consideration of S&T development began with the perspective of promoting development of the national economy. Added to system factors, this created a mutual detachment of S&T and the economy. It should be noted that many comrades still hold this guiding ideology today. They have not been concerned with technology conversion and have no use for technical service work, which is very serious. The second is that during technology selection and development in the past, we considered mostly political and military factors and concentrated mainly on high, precision, and incisive technologies. We ignored development of appropriate technologies which have a rather broad range of effects on development of the national economy and invested too little. This resulted in lower production technology levels, terrible product quality, and excessive consumption of energy resources and raw materials. We must work hard to solve this problem. When discussing this point, some comrades introduced several areas that the Japanese considered when evaluating a technology: One is a look at technical levels—have we really grasped this technology? The second is a look at its political and military significance. The third was a look at its economic significance. They noted not just technologies they understood but also the extent to which the technologies had been extended, economic benefits and competitive abilities it might bring, and so on. In comparison, China has focused more on the first two points while ignoring the last point. This is a difference in our understandings. If we begin with this point in considering technological development, we cannot ignore the role of technical abilities. Thus, we must form a rational personnel structure composed of multiple layers of personnel including scientists, engineers, skilled technical workers, and others. If one part is missing, it will not work.

3. Experiences and lessons in planning work. Practice has proven that when government departments make technology selections and plan all disciplinary categories, the role is very limited. Comrades at the meeting pointed out that plans compiled in 1956 filled three large volumes which were added to later disciplinary plans. Did all these plans actually play a significant role? It is quite doubtful. The planning situation was the same in 1962, and the later implementation situation showed that excluding the "nine major pieces of equipment and ten great formworks" involving limited goals that were implemented to a greater extent, the remainder never played a very good role. This shows that prominent points in plans are hard to achieve effectively.

4. Problems in administrative work. Some comrades stated that we have done well in planning, but that the results of implementation were not that good. Poor management is an important reason. Poor management is reflected in: One, a lack of timely summaries of program and plan implementation. When work was completed, we failed to search out successful experiences and existing problems. This made it hard to improve and guide later work. For example, the "ten big agriculture centers" were handled rather well but we did not summarize experiences and extend time, so they played no obvious role in promoting the national economy. A second is the lack of continuity in policies, usually due to political movements and repeated changes in leaders. This caused cessation or interruption in plan implementation. This is another lesson we should absorb.

III. Opinions on Future Technology Selection and Development Work

Many comrades feel that environmental conditions we face now are quite different from those a few decades ago. This is very important for our technological selection and development work. First, China's market mechanisms are just in the process of forming. Before, we had a product economy and project planning could be done with a single unified plan which was included in state

plans and then passed down for implementation. Still, I feel that this method will be hard to follow in a planned commodity economy in the future. Second, there have been shifts in our strategic points. In the past, our technological selection and development work concentrated forces on serving the goals of national defense. This was done under special historical conditions and in consideration of political and military needs. Now, the international and domestic situations have changed and our strategic focus has shifted to the four modernizations drive and service to economic construction. As this strategic focus has shifted, economic activity has become a wide ranging activity for all of society. It is hard to think of concentrating on just a few projects as goals. The variety and complexity of technological selection in the new situation is an important characteristic of our future work. Third, opening up has made us compete in a highly competitive international environment. China's implementation of a policy of opening up to the outside world objectively no longer allows us to deploy slowly and change slowly in our technological selection and development work. We now face challenges from international markets and attacks from foreign commodities. This situation has destroyed our long-term situation in the past of closing off the country and industrial protection policies. We can still have some limited protection policies but large scale protection policies are not feasible. Moreover, such protection policies also may make our industry even more backward. Fourth, the pace of technical renewal is now accelerating. Of course, world technology is constantly developing and the time span of technical renewal is becoming shorter and shorter. In the past, however, our system prevented rapid technological changes and we lacked a capacity for market strain. If we fail to change this situation and adapt to the new internationals situation, we may fall even farther behind.

In view of these understandings, comrades at the conference repeatedly offered many beneficial opinions concerning reform of the S&T system and reform of S&T selection and development work:

1. There must be a conceptual change. Many comrades pointed out that one major cause of mistakes in our past work was a lack of a correct and scientific understanding of several basic concepts. For example, we made no distinction between "science" and "technology" and did not closely integrate the relationship between "technology and the economy" and "technology and commodities" as a starting point for considering problems. This was not comprehensive. Ignoring "conversion of technologies into commodities and conversion of commodities into technologies" was a mistake. To reduce mistakes in our future work, it would seem that we must make a conceptual change.

2. We must change social evaluation standards for S&T. First, we must separate the two concepts of "science" and "technology" and we cannot use scientific standards to request technologies or use technological standards to request sciences. Second, we cannot use "normal domestic (international) levels and advanced domestic (international) levels" as the sole criterion for evaluating technologies since this type of evaluation is not very significant. We should replace it with market criteria and look at whether or not a technology can be converted into a commodity and whether or not it can stand on its own feet in market competition.

3. S&T development strategies must be readjusted. It will be hard forus to reduce the difference between China and the developed nations in certain areas within a certain period of time, and it will certainly be hard to avoid the pain of temporary backwardness. Thus, maintaining and reducing the discrepancy has been our long-term S&T strategy. We should increase our inputs in appropriate technologies and develop applied production tools and equipment targeted at individual ownership and use by workers and stimulate their vitality and adapt to the new procedures of a commodity economy.

4. We must establish new mechanisms for technological selection and technological development. Market mechanisms should be the new mechanisms which replace the planned economy of the past. Practice over several decades in China has proven that although market mechanisms have defects, overall they can flexibly regulate production and consumption, so they are superior to traditional planning mechanisms. We must create an external environment of fair competition to enable enterprises to select technologies they need themselves via market competition. A change in government functions is very important for achieving this point.

5. Government departments should change functions. A somewhat unanimous view was that in the new situation government departments which administer technology should focus mainly on technological selection and the technological development environment to promote the formation of an integrated development mechanism for technology and the economy. They should carry out macro policy guidance of S&T in China and get out of project management. Some comrades felt that government departments should seriously study the relationship between S&T and politics and the relationship between S&T and society and use this as a foundation for formulating S&T programs to guide long-term S&T development. In adaptation to this, government departments should no longer manage technological selection in an all-encompassing manner. They should instead concentrate their forces on advocating technologies which everyone has neglected but which are especially needed. Other comrades feel that government departments should increase their concern for developing applied basic technologies.

6. The investment environment for S&T development should change. Most comrades felt that the method in which the state usually provides all the investments for scientific research work should be changed, and we should gradually make a transition to the path of integrating state investments and social capital raising to use many channels to raise capital for scientific research.

Some scientific research organs which have a development capacity should use their own funds and raise capital themselves to do scientific research. We have accumulated many successful experiences in this area over the past few years and they should be extended.

Ruan Chongwu on Management of Science and Technology Planning

40080226a Beijing ZHONGGUO KEJI LUNTAN [FORUM OF SCIENCE AND TECHNOLOGY IN CHINA] in Chinese No 4, 18 Jul 89 pp 1-4

[Excerpts of Ruan Chongwu's [7086 1504 2976] speech, edited by Mu Gongjian [4476 1872 6197]: "Comrade Ruan Chongwu Discusses Science and Technology Planning and Management Work"]

[Text] [Editor's note:] State Science and Technology Commission vice minister Ruan Chongwu spoke at the National S&T Planning and Management Work Conference. Excerpts of the second part of Ruan Chongwu's speech "On Planning and Management Work in the State Science and Technology Commission" are published here.

The "three fixed" program for reform in State Science and Technology Commission organs was approved by the State Council in September 1988. The State Council stated clearly that the State Science and Technology Commission is a professional department of the State Council charged with comprehensive management of S&T work throughout China. The focus of future work in the State Science and Technology Commission is to further reinforce macro management and combine continued emphasis on formulating and implementing national S&T development strategies, principles, and policies with further strengthening of S&T planning work, reinforcing system reforms, S&T laws and regulations, technical markets, basic research, industrial S&T, rural S&T, S&T guidance of social development, S&T awards, international S&T cooperation and exchanges, and other work.

The main duties of the State Science and Technology Commission are:

1. To study and analyze major issues in using S&T to promote economic and social development, and to organize and draft China's S&T development strategies, principles, policies, and laws and regulations.

2. To study and confirm realms for advanced S&T development in development of the national economy, organize and formulate long-term plans for S&T development in China, coordinate State Planning Commission formulation of medium and long-term development programs and plans, formulate annual plans according to overall guiding arrangements (including project foci and expenditure totals) proposed by the State Planning Commission, and take responsibility for organizing implementation and management of expenditure allocations after the State Planning Commission reaches an overall balance.

3. To meet with relevant departments to study and formulate principles, policies, and measures to reform China's S&T system, organize and promote work to reform the national S&T system, and study and suggest rational structures and deployments for national S&T organs.

4. To meet with relevant departments for comprehensive application of financial, credit, tax, and economic levers and measures and the expenditures for conditions managed directly by the State Science and Technology Commission for macro regulation and control over S&T work operations.

5. To guide and coordinate S&T advances by all State Council departments and all provinces, autonomous regions, municipalities directly under the central government, and planning list cities, and to coordinate the relevant departments in promoting technical progress in all industries.

6. To study and propose policies and measures extending from basic research, applied research, and technical development to industrialization and commercialization, take responsibility for managing registration, appraisal, awards, extension, and S&T secrecy work for China's major S&T achievements, assume responsibility for managing technical market work, and manage technology export work in conjunction with relevant departments.

7. To meet with relevant departments to formulate policies for China's international S&T cooperation and exchanges, assume responsibility for administering S&T cooperation with foreign countries, guide S&T organs stationed in foreign countries, and assume responsibility for selecting and managing cadres in China's embassies and consulates in foreign countries.

8. To assume responsibility for managing China's S&T information work and responsibility for S&T statistical work within the scope of State Science and Technology Commission administration.

9. To coordinate with relevant departments for technology importing, digesting, absorbing, and innovation.

10. To complete other work assigned by the State Council.

In the area of S&T working relationships with all departments, areas, and primary industries, the State Science and Technology Commission is mainly concerned with coordination work.

The working relationship with local S&T commissions mainly involved providing good technical guidance and service work.

To fulfill these duties, the State Science and Technology Commission has established 13 subsidiary professional departments, a slight increase over the previous number. The 13 departments are the Office Department, Personnel and Labor Department, Policy, Laws, and Regulations Department, Comprehensive Planning Department, System Reform Department, Conditions and Financing Department, S&T Achievements Department, International S&T Cooperation Department, Industrial S&T Department, Basic Research and High Technology Department, Rural S&T Department, Social Development S&T Department, and S&T Information Department.

Compared to the former organs of the State Science and Technology Commission, three new departments have been added, namely the System Reform Department, Social Development S&T Department, and Rural S&T Department (including the former "Spark Plan" Planning Office). Establishment of these three departments will strengthen control and coordination of China's S&T system reform work, further reinforce relationships with local S&T commissions, and strengthen comprehensive S&T work in medicine and public health, demography, environmental resources, and other areas. It will use S&T to guide social development and reinforce formulation of principles, policies, programs, and plans for rural S&T work, and further organize and implement the "Spark" Plan and promote development of rural S&T. The former Comprehensive Bureau was changed to the Comprehensive Planning Department for further reinforcement of planning and management functions of the State Science and Technology Commission.

Years of exploration and practice in promoting S&T reforms have gradually clarified the basic thinking in our deployment of S&T work. It is that strategic deployments of China's S&T work can be divided into three main levels. The first level is work to develop research which directly serves the strategic goal of quadrupling our GNP by the end of this century. The main tasks are to carry out technical transformation in traditional industries, concentrate on key S&T topics suggested during economic construction and social development, undertake attacks on S&T problems, promote technical progress in large and medium-sized enterprises, township and town enterprises, and rural areas, and improve technical levels and economic results in industry, agriculture, and other sectors. This is the main battlefield of S&T work. At this level, the State Science and Technology Commission has two plans for organizing coordination and management. One is a plan for attacks on key topics, which is a research plan. The other is the "Spark" Plan, which is a development plan. The second level is R&D for emerging technology and high technology. The main tasks are to make breakthroughs in research on high technology realms which significantly affect economic, S&T, national defense, and social development, push forward and promote formation and development of emerging industries and high technology industries, track advanced world technological levels, and promote implementation of our coastal development strategy. At this level, the State Science and Technology Commission focuses on a research plan and the "863" Plan. The development plan is a "Torch" Plan. The third level is basic research, which involves the foundation and backing for S&T development. It is extremely important work which involves looking toward even longer term development of the nation and promoting continued S&T, social, and economic progress. In this area, many projects are arranged by the State Natural Sciences Fund Commission, but the State Science and Technology Commission also focuses on supporting basic research work. China's S&T work must be deployed on these basis of these three levels for quite some time to come. It can be said that this is a major structure in China's S&T work since the Seventh 5-Year Plan, and we have arranged plans in five areas on the basis of this thinking.

Because plans for these five areas are deployed according to levels and each has its own characteristics, they vary in scope of plan activities and management patterns, so some points should receive attention in planning and management work.

1. Clarify a professional division of labor, implement management by plan category.

Plans in these five areas have different characteristics and scope of targets as well as different management patterns, so there is no single model for plan management. Of course, all plans in these five areas should be included in the state's comprehensive plans for economic and social development to facilitate unified coordination and balance by the state. At the same time, we also hope that plans in these five areas can be embodied in national economic plans.

Plans for attacks on key S&T topics in the Seventh 5-Year Plan were mainly targeted at key S&T topics suggested during national economic construction and plans in order to organize research on key topics. The State Planning Commission is the primary party in this plan, and it works in conjunction with the State Science and Technology Commission to formulate medium and long-term S&T development programs and plans. The overall guiding arrangements (including project foci and expenditures) suggested by the State Planning Commission serve as a basis for organizing the formulation of annual plans. After the State Science and Technology Commission achieves a comprehensive balance, they are responsible for organizing and implementing management of expenditure allocations. The Comprehensive Planning Department also recently began working with comrades in the State Planning Commission to compile a plan for attacks on key S&T topics for the Eighth 5-Year Plan.

The characteristics of the "863" Plan are that it takes aim at the leading edge of high science and technology development, and tracks advanced world levels. This plan also is a research plan, but it differs from the former

plan in administration. This plan is administered via an expert committee responsibility system under guidance by the State Science and Technology Commission and National Defense Science and Engineering Commission. This plan solicits bids, makes selective assignment, and other things to implement tasks in optimum units or expert collectives. Part of the plan is administered by the Basic Research and High Technology Department.

Both of these plans are research plans which have "limited goals and prominent foci." There cannot be too many projects because this would lead to "spreading pepper around." Thus, we must select the most important projects for more concentrated investments. The conditions for these plans are guaranteed. Due to the greater risk and large investments, and the state should provide more financial support.

There are two other development plans, the "Spark" Plan and the "Torch" Plan.

The "Spark" Plan adopts advanced appropriate technologies to invigorate local economies. This plan mainly relies on implementation by provinces, municipalities, and relevant departments. The research funds come mainly in the form of loans with the state providing only guiding funds. Plan projects are arranged via a matching investment pattern. Moreover, they are managed according to the principle of "expanding scale, promoting integration, and establishing systems." The main subsidiary administrative organ of the State Science and Technology Commission in this area is the Rural S&T Department.

The aim of the "Torch" Plan is to use domestic and foreign markets as a guide, new technology products as the lead, and new technology research achievements as the foundation to cultivate and support high technology enterprises and promote formation and development of high and new technology industries. The main characteristics of the "Torch" Plan is that regions with suitable conditions establish several new technology industry zones and several S&T innovation pioneering zone service centers. They stress enterprise initiative and require S&T inputs. With dual level management of plan administration by the state and localities, capital sources depend mainly on loans. The subsidiary professional department of the State Science and Technology Commission which administers the "Torch" Plan is the Industrial S&T Department.

The state's basic research plan is a research plan which lays a scientific and technical foundation for sustained development of the national economy. It reveals the laws of natural development and serves as a backing for technical development, so it has a very far-reaching significance for economic and social development. The essence of work in this area is scientific and scholarly, so it has its own administrative characteristics. The development of technology relies mainly on market demand for promotion and the development of science relies on discussions and exchange, as well as on vigorous scholarly thought to explore natural and hidden laws. Thus, administration of this plan does not involve directive-type planning. This plan is administered in principle by the State Science and Technology Commission and makes full use of the role of the Chinese Academy of Sciences, State Education Commission, Natural Science Fund Commission, and other departments. Its administrative pattern adopts a method in which the State Science Fund orients toward the whole nation via voluntary application and public competition, and it relies on an expert appraisal system to implement evaluation by others in the same field for selective support. The subsidiary administrative organ for this plan is the Basic Research and High Technology Department.

Thus, these five plans are managed by four subsidiary professional departments. They integrate with the Planning Department for planned comprehensive balance, and the Conditions and Finance Department is responsible for administering and supervising S&T expenditures to assure smooth plan implementation.

2. Reinforce macro guidance, implement plan administration by levels.

When we say reinforce plan administration, we do not mean management of the plan to extremes, nor do we mean that the State Science and Technology Commission will manage all affairs, great and small, involved in plan activities. Instead, we hope to transfer authority downward as much as possible so that everyone takes the initiative to do good work in this area. The State Science and Technology Commission mainly uses principles, policies, regulations, laws, and so on to assure effective implementation of planning and other administrative work in a procedural fashion. In concrete working methods, we advocate administrative responsibility for plan projects. The State Science and Technology Commission implements focal administration only for major S&T projects which involve many disciplines, cross industry boundaries, and concern many departments and regions, mainly by organizing coordination, supervision, and inspection and doing good service to assure smooth overall implementation of S&T plans and attain the projected goals. We hope that all departments and localities which can independently organize and administer plan projects and related work will become involved. Make full use of initiative in S&T management departments at all levels and focus on plan administration work. Local science and technology commissions should continue to work according to the old methods and should not demand a division of labor model like that of the State Science and Technology Commission.

In the area of S&T fund utilization, we advocate effective application of market mechanisms and competitive mechanisms, and adopting grants, loans, capital raising, and various other patterns according to different categories of S&T projects for support. We must change the old methods of allocating funds according to departments, provinces, and municipalities, and mainly use

announcement of plan "project guides" to suggest project applications, solicit bids, select the best, and other ways to support concrete S&T projects. We also should implement compensated utilization of S&T funds and improve the utilization efficiency of capital.

3. Intensify reforms and actively explore new routes for optimum administration of S&T plans.

S&T plans and systems for administering their funds should meet the needs of a socialist planned commodity economy. Closely integrate S&T with the economy and promote sustained development of the national economy. We stress that to establish and implement an S&T plan, the direction, scale, and structure of S&T expenditures should embody state S&T policies. For example, if we advocate "using S&T to invigorate agriculture," this must be embodied in the plan. Or, for example, we now focus on communications and energy resources, and these should be embodied in the plan. Policies cannot require everything to the same, but plans should be administered in the same way. A lack of matchup is not feasible. Moreover, our S&T plans cannot simply orient toward research academies or institutes, but instead should consider enterprises and rural areas. In addition, our S&T plans are not simply research plans, but also include development plans. Thus, S&T plans should orient toward industry, agriculture, and all of society.

S&T plan administration should comprehensively apply economic measures, legal measures, and administrative measures to gradually establish an effective macro regulation and control system. Our S&T system reforms include reform of traditional S&T plan administration systems. We have done some work on this in the past. When organizing implementation of projects to attack key S&T problems in the Seventh 5-Year Plan, we carried out project management by categories and a compensated allocation system by dividing projects into A, B, and C categories and repaying state allocations in different proportions according to the length of R&D schedules and ability to repay. This requires us to change the past method of uncompensated utilization of S&T expenditures. It also creates the conditions for implementing a project bid solicitation system and comprehensive implementation of a project contract system. When working on the "Spark" Plan, implement administration by levels and make the role of project demonstrations prominent. Promote all forms of integration and adopt an expenditure management system with joint investments for plan expenditures and mutual risk sharing. Practice has proven that this method is feasible. In implementing the "863" Plan, adhere to the principle of allocating funds according to research tasks and give full play to the role of expert committees, with experts deciding on technology choices and expenditure allocations, participating directly in management, and exploring patterns for using the administrative role of experts in the realm of high technology research. Later, we plan to assign experts, including managerial personnel and economic experts, to aid us in supervising and inspecting plan implementation. Plans often lose their form when there is no inspection and supervision. We also should formulate the corresponding reward and punishment regulation systems. In administering basic research plans, the State Natural Science Fund Commission established a complete set of project management methods which should be considered by the experts. Fund projects undergo appraisal by experts in the same field and examination and revision by scholarly groups to enable scientific research personnel to engage in equal competition on a similar foundation and increase the transparency of fund project administration. In the future, we are preparing to use more "project guide" announcements in KEJI RIBAO [SCIENCE AND TECHNOLOGY DAILY] for project appraisal and selection and for project implementation conditions. In summary, much work remains to be done in this area and many plan administration issues must be studied and improved. We should use the spirit of reform to study and analyze many concrete issues in S&T plan administration and make further explorations when implementing plan administration work to continually improve and perfect work in this area.

Chinese Aircraft Engine Manufacturing Enterprises Listed

40080225 Beijing HANGKONG ZHISHI [AEROSPACE KNOWLEDGE] in Chinese No 7, Jul 89 pp 8-9, 21

[Text]

Aircraft Engine Manufacturing Enterprises

1. Li Ming Engine Manufacturing Company

Address: Shenyang City
P.O. Box 424, Shenyang City
Telephone: 442779
Cable: 4104
Teletype: 80025 LMMCS CN

Overview

The Li Ming Manufacturing Co. is an aircraft engine enterprise established during the period of China's First 5-Year Plan. Its construction began in 1954, and operation began in April 1956. The first jet engine developed by this company was the TJ-5, which was a centrifugal type jet engine with afterburner; it was used on the F-5 and the FT-5 aircraft. Later, an axial-flow type jet engine, the TJ-6, was developed. The TJ-6 has a net thrust of 2,600 kg and an augmented thrust of 3,250 kg with afterburner; it is primarily used on the F-6 aircraft and the A-5 aircraft. The TJ-7, which is a twin-rotor jet engine developed by this company, has a 6-stage axial compressor, an annular combustion chamber and a 2-stage turbine (high and low pressure); it has a net thrust of 4,400 kg and an augmented thrust of 6,100 kg with afterburner. All three engines were mass-produced, and a limited number of them were exported. Currently, this company is working with other research organizations to develop a new jet engine.

Since 1980, the company had shifted its focus from solely military products to both military and commercial products. It had established factories for producing such commercial products as industrial gas turbines, aluminum alloy doors and windows, and superchargers for automobiles. In 1984, the volume of commercial products had exceeded the 100-million yuan level.

The company has also made significant progress in terms of international trade. For example, its products are currently being sold in more than 10 different countries; it has also established economic, technical, and commercial relations with more than 20 countries, and is actively pursuing various forms of international cooperation such as technology transfer, material processing, compensation trade, and exchange of personnel.

2. Xi'an Aircraft Engine Company

Address: Xi'an City, Shanxi Province
P.O. Box 13, Xi'an City
Telephone: 723916, 61951
Cable: 5411

Overview

The Xi'an Aircraft Engine Co. is a large, integrated enterprise whose main product is aircraft engines. It has a 30-year history of developing and producing high-power aircraft engines.

The TJ-8 axial-flow type jet engine (including the WQJ-1 turbostarter) developed by this company is the powerplant of the medium-range bomber the B-6. It has a rated thrust of 7,650 kg and a maximum thrust of 9,500 kg. A number of improvements have been incorporated in the TJ-8 engine during its production.

This company has also signed an agreement with the British Rolls Royce Co. to purchase the patent rights for manufacturing the Spey engine; in November 1979, it successfully produced the first Spey engine and renamed it the TF-9. Later, certain modifications were made to the TF-9 engine to enhance its versatility.

This company has a full line of high-precision, state-of-the-art production equipment and machine tools such as digitally-controlled boring machines, digitally-controlled milling machines, digitally-controlled lathes, creeping-grinding machines, digitally-controlled pipe-bending machines, and three-axis and five-axis digitally-controlled processing facilities.

Organization

This company has five departments: the Business Department, the Engineering and Development Department, the Manufacturing Department, the Administration Department, and the Quality Assurance Department.

1) The Business Department consists of the following branches: the Office of Domestic Affairs, the Overseas Trade Branch, the Market Research Branch, and the Business Administration Branch. The primary responsibility of the Business Department is to develop domestic and international markets; to provide information for making business decisions by conducting market surveys and forecasts; and to organize product sales and to provide post-sale technical services.

2) The Engineering and Development Department consists of the following branches: the Engine Design Office, the Processing Branch, the Metallurgical Branch, and the Process Research Branch. The Engine Design Office is responsible for analyzing and improving the performance of different types of engines. It has a test facility for conducting thermal and strength tests of engine components; it also has state-of-the-art test equipment for conducting thermal shock tests, combustion tests, and pneumatic vibration tests.

3) The Manufacturing Department consists of two branches: the Production Preparation Branch and the Cold and Hot Processing Branch. It has the facility to apply many advanced processing techniques such as metal coating, chemical milling and cutting, vacuum heat treatment, electron-beam welding, creep-grinding

and shape-grinding, electrolysis, titanium alloy thermal shaping, high-temperature chrome plating, and soft nitrogenization.

4) The Administration Department consists of four branches: the Administrative Branch, the Finance Branch, the Labor Relations Branch, and the Industrial Management Research Branch. In recent years, significant progress has been made in the areas of network techniques, target management, production process control, and the use of computers in management and after-sale service.

5) The Quality Assurance Department is responsible for managing product quality for the company. It has established a comprehensive quality control and management system. Throughout the company there are 106 QC teams actively working at every key processing node and every critical-part production unit.

In order to improve the cultural and technical standards of the employees, the company has established an employee training system which includes engineering colleges and professional and technical schools.

3. Nanfang Power Machinery Company

Address: Zuzhou City, Hunan Province
P.O. Box 211, Zuzhou City
Telephone: 21151
Cable: 2820
Teletype: 99502 CHENF CN

Overview

The Nanfang Power Machinery Co. is China's research and production center for medium and small aircraft engines, gas turbines, and heavy motorcycles.

The aircraft engines developed by this company include the P-5 and P-6 engines and a series of improved piston engines. In the late 1950's, the company began developing turbine engines. In 1967, it successfully developed the TP-5 turbo-prop engine. In 1976, the TP-6 engine was certified for production. In 1980, it purchased the patented technology of the French Arriel-1C free-axle engine and began its own development effort; this engine has already been certified and is currently in production; it has been given the model number TA-8. At present, the company is concentrating its efforts on developing a powerplant for the next-generation short-range commercial aircraft.

Since the 1960's, this company has been involved in modifying existing aircraft engines for other applications. For example, the P-6 engine was modified to drive compressors for collecting natural gas; the TP-5 engine was modified to be a power source for ground air supply. The TP-6 engine has been modified a number of times to provide a series of gas turbine products for electric power stations, hovercraft, locomotives, and warships. In addition, the company is also cooperating with the U.S. Allison Co. to develop a heavy-oil gas turbine for powering locomotives.

The company has been manufacturing motorcycle engines for almost 30 years. Production of the famous Chang Jiang-750 motorcycle engine has reached a level of 50,000 units per year. The Nanfang-125 twin-seat motorcycle, which was developed using imported Japanese technology, is now completely manufactured in this country; currently, the company has the capability of producing 100,000 engines and 30,000 motorcycles.

Another line of high-quality products of this company are model engines. These products have been used on model aircraft and model ships; they have broken or set world records 25 times and won 3 world championships.

Organization

The company has three departments and six factories. The three departments are: the Research and Development Department, the Process Research Department and the Measure and Instrument Department.

On-Board Equipment Manufacturing Enterprises

1. Bao Cheng General Electronics Company

Address: Baoji City, Shanxi Province
P.O. Box 38, Baoji City
Telephone: 2901
Cable: 2413

Overview

This company was established in August 1955. During the past three decades, it has become China's major aircraft instrument company whose main product line is gyroscopic navigation equipment. It is responsible for the development and production of flight-bearing and attitude gyroscopes, position indicators, magnetic and integrated compasses, guidance systems, inertial navigation systems, and various types of precision machinery and electrical components.

Nearly 400,000 different instruments and large number of parts used on China's aircraft and ships are produced by this company. It has also exported 8,000 different instruments and various test equipment to 13 different countries.

The primary non-aviation products of this company are air conditioners; it has a production line capable of producing 100,000 units per year. There are four different types of air conditioners produced under the trade mark "Bao Hua": the window air conditioner, the modular type air conditioner, the small residential air conditioner, and the ship-borne air conditioner. There are a total of 18 different model numbers, ranging in capacity from 1,000-8,000 KCAL.

Organization

Administratively, this company has a manager-responsibility system. It has a new-product research bureau dedicated to the development of new gyroscopic navigation equipment; it also has a production management office and a production shop. In addition, the company has four subsidiaries: the Air Conditioner Co., the Test Equipment Co., the Tool Manufacturing Co., and the Power Equipment Co.

2. Chang Feng Machinery Factory

Address: Suzhou City, Jiangsu Province
P.O. Box 5, Suzhou City
Telephone: 24621
Cable: 1056
Teletype: 36302 SZTLX CN

Overview

The Chang Feng Machinery Factory was established in April 1966; it is one of the major enterprises for developing and producing aircraft and engine instruments and equipment.

The main products of this company include: onboard electronic instruments, sensors and electronic regulators, digitally-controlled electric-spark line-cutting machine tools, electrolysis processing equipment, various types of mechanical measuring devices and small knives and hand tools. The line-cutting machine tools and calipers are sold overseas.

Organization

The factory has 2 research institutes, 6 branch factories, 3 shops, 1 training center and various offices in charge of production, technology, supply and sales.

The No 1 Research Institute is responsible for the research and development of cabin layout and human engineering design is[illegible], and the design of electronic displays; in recent ye[illegible] has developed the prototype of an onboard multi-f[illegible]tion down-looking sensor.

The No 2 Research Institute is responsible for the research and development of measurement, control, and display techniques of engine parameters, various aircraft instruments, and engine electronic regulating systems. The products developed by this institute have been used on Chinese-built fighter aircraft, bombers and helicopters.

3. Chengdu Aircraft Instrument Company

Address: Chengdu City, Sichuan Province
P.O. Box 229, Chengdu City
Telephone: 23937
Cable: 3237
Teletype: 60105 CAIC CN

Overview

This company is the research and production center of digital atmospheric computer systems and a manufacturer of various types of sensors and signal devices. Its main products include:

(1) Airborne atmospheric data computer: By importing advanced manufacturing technologies and complete production lines from abroad, this company has acquired the capability of building airborne atmospheric data computers that approach world standards. A variety of atmospheric data computers have already been developed for both military and commercial aircraft.

(2) Sensors and indicators: They can be used to measure physical parameters such as relative pressure, absolute pressure, pressure difference, pressure ratio, acceleration and strain. The sensing elements used on the sensors include bellows type elements, vibrating-tube elements, silicon pressure-impedance type elements, and strain gage type elements. The sensor output has both analog and digital formats. These sensors are currently used in aerospace, petroleum and chemical industries as well as on locomotives and tanks.

(3) Pressure annunciator: The company has designed a variety of pressure annunciators which are widely used to provide warning signals and switching signals in automatic control systems. It has also developed altitude annunciators, pressure-difference annunciators and Mach number annunciators.

In addition, the company has established a production line of refrigerator temperature-control devices with an annual production of 300,000 units, and a special production line for sensors used in pressurized containers.

Organization

The company has four research institutes which are responsible for the research and development of both aviation and non-aviation products. It has a number of workshops specialized in the following areas: mechanical processing, stamping, and manufacturing of sensing elements, heat treatment and surface treatment, and final assembly. It also has four offices in charge of planning, sales, quality management and technology.

4. Jiang Han Machinery Company

Address: Xiangfan City, Hubei Province
P.O. Box 157, Xiangfan City
Telephone: 41225, 41302
Cable: 0319

Overview

This company is a combined research and production enterprise which includes the following organizations: the Aircraft Ejection-Escape Research Institute, the Helmet and Flight Suit Manufacturing Plant, and the Parachute Manufacturing Plant.

The company is primarily engaged in the research and development of aircraft ejection seats, parachutes and protective flight suits; it is also responsible for conducting rocket rail-ejection tests, parachute tests, parachute-suit wind tests, and integrated tests of protective flight suits.

The main products of this company include: ejection seats for fighter and bomber aircraft, life-preserving parachutes, aircraft braking-chutes, parachutes for dropping aerial bombs and supplies, compensation suits, load protection systems, and sea rescue equipment. The company also produces hot balloons.

5. Baoding Propeller Manufacturing Plant

Address: Baoding City, Hubei Province
P.O. Box 818, Baoding City
Telephone: 37441, 37442
Cable: 7272

Overview

Organization and construction of this plant began in 1962, and operation began in 1964. It is primarily responsible for the design, development and production of aircraft propellers and rotor blades and tail rotors of helicopters. In addition, it also produces the blades for various wind-powered machines.

Organization

The plant has a number of workshops specialized in mechanical processing, casting, forging, heat treatment and surface treatment, propeller assembly, and blade manufacturing (including composite material products); it also has offices in charge of design and technology, and test facilities for conducting fatigue tests and composite-material tests.

Chinese Aviation Manufacturing Enterprises Detailed

40080208 Beijing HANGKONG ZHISHI [AEROSPACE KNOWLEDGE] in Chinese No 6, Jun 89 pp 11-13

[Text] Chinese aviation manufacturing enterprises can be divided into three main categories: aircraft manufacturers, engine factories, and onboard equipment factories. They also include a number of factories which produce forged and cast parts, and various tools and equipment. In this article, five major aircraft manufacturing companies are introduced; however, two other companies, the Chengdu Aircraft Manufacturing Co. which designs and produces fighter aircraft, and the Shanxi Aircraft Manufacturing Co. which designs and produces transport aircraft, are not included here.

1. The Shenyang Aircraft Company

Address: Shenyang City
P.O. Box 328, Shenyang
Telephone: 62680
Cable: 3058
Telex: 80018 SAMC CN

Overview

The Shenyang Aircraft Co. is a large aircraft manufacturing enterprise established in 1951, when China began the First 5-Year Plan. Its main mission is to develop and produce fighter aircraft.

In the early 1950's, it was primarily in the business of repairing MiG-9 and MiG-15 aircraft. At the same time, it began building its own aircraft; China's first fighter aircraft, the F-5, was developed and mass-produced here. Subsequently, it produced the F-6, the FR-6, the FT-6, and the F-7 supersonic aircraft. In 1966, it began development of the high-altitude, high-speed fighter aircraft, the F-8; after completion of the F-8 design, it also developed two improved versions of the F-8, the all weather F-8 and the F-8 II. The successful development of the F-8 II reflected the high technical standards of Chinese-built supersonic fighter aircraft.

Since the 1980's, this company is being gradually transformed into a dual-purpose enterprise which develops both military and commercial products, combines scientific research activities with production activities, and provides services for both military construction and economic development. In addition to building aircraft the company is also involved in the development of non-aviation products such as air-cushion boats, luxury recreation vehicles, passenger vehicles, aluminum construction products, and washing machines.

Organization

The aircraft-products division of the company consists of the following factories: assembly, mechanical processing, plating, heat treatment, non-metallic processing, tool manufacturing, and flight test station. The non-aviation products division consists of the following factories: automobile assembly, electrical appliances, and aluminum-alloy products.

The research and development division is an independent organization which is China's first aviation research plant devoted to the development and design of fighter aircraft technology. Today, it has over 500 technical personnel engaged in product design, research, and testing. It has various test equipment, instruments and gauges which can be used for load tests, pressurization tests, and evacuation tests of fighter aircraft and commercial aircraft up to a Mach number of 2, weight of 15 tons, overload of 7.0-7.9 g, and altitude below 25 km. They are also used to perform environment tests of onboard microwave equipment and systems, and production equipment.

The first aircraft developed by this division was the FT-1, which had its maiden flight in 1958. In 1966, it began designing the F-8 aircraft; later, it also succeeded in developing the improved F-8 II. The F-8 II is a single-seat, twin-engine high-performance supersonic fighter aircraft; it is designed to defend against invading

high-speed enemy aircraft and to launch air-to-ground weapons. The F-8 is one of the major weapons systems of the Chinese Air Force. The company's future plan is to continue its efforts in improving the technical and combat performance of the F-8 aircraft.

2. The Nanchang Aircraft Manufacturing Company

Address: Nanchang City, Jiangxi Province
P.O. Box 5001, Nanchang City
Telephone: 41112
Cable: 5120
Telex: 95068 NAMC CN

Overview

The Nanchang Aircraft Manufacturing Co. is one of the early aircraft manufacturing enterprises of new China. Over the past 30 years, it has evolved into a large manufacturing enterprise where research and production activities are closely coordinated and both military and commercial products are developed.

This company has developed and produced a wide range of aircraft and missiles. In 1954, it developed its first propeller trainer aircraft, the Yak-18. In 1957, the Y-5 multi-purpose transport aircraft was developed. In 1958, the PT-6 trainer aircraft was designed, and more than 1,000 units were produced, many of which were exported to other countries. In 1969, the A-5 supersonic attack aircraft was developed, and in 1970 it was delivered to the military services; a limited number of this aircraft was also exported. The A-5 can penetrate enemy defenses at low altitudes to attack such targets as infantry headquarters, rocket and missile bases, tank fleets, airfields, and communication centers. Currently, the company is working in cooperation with the Italian aviation industry to improve the onboard electronic equipment of the aircraft. In addition, it also developed the F-12 short takeoff and landing fighter and the Jingangshan-4 transport.

This company has also designed and produced a number of tactical missiles.

Organization

1) The Aircraft Development Department is responsible for the tasks of aircraft design, research and tests. It has nine offices which include integrated design, aerodynamic design, strength design, structural design, system design, special design, system simulation, and weapons and ground simulation. It also has five laboratories: strength laboratory, system laboratory, bird collision laboratory, special laboratory, and weapons laboratory.

2) The Missile Development Department has three design research offices devoted to the development of the "Flying Dragon" missile; it also has an integrated missile test laboratory which can perform simulation tests, special tests, dynamic tests, and weapon system tests.

3) The Process Research Bureau over the years is responsible for the accomplishments in developing explosive-shaping techniques, electrolysis processing techniques, digital control techniques, and pellet reinforcement techniques. In particular, the 1,500-ton sealed explosion press and the 40-ton-meter explosive hammer received the national third-place and first-place invention awards respectively.

4) The Commercial Product Research Bureau is mainly involved in motorcycle design and research. It has a frame design office, an engine design office and a motorcycle test laboratory. The Nanchang Aircraft Manufacturing Co. was one of the early motorcycle manufacturers in this country. As early as 1957, it had developed the Chang Jiang-750 three-wheel vehicle, and began its mass-production for a number of government agencies. It had also developed special-purpose motorcycles for the departments of transportation, taxation, commerce and measure.

The Nanchang Aircraft Manufacturing Co. is actively pursuing international cooperation. In recent years, it has sent technical personnel to the United States, Great Britain, France, West Germany, and Japan for tours and for technical exchanges; it has also signed agreements with Italy, Japan, and Pakistan to cooperate in development and production efforts.

3. The Xi'an Aircraft Company

Address: Yanliang District, Xi'an City, Shanxi Province
P.O. Box 140, Xi'an City
Telephone: 61971-61974
Cable: 2041
Telex: 70101 XAC CN

Overview

The Xi'an Aircraft Co. was established in 1958; it is China's main developer and producer of medium-range bombers and commercial transport aircraft.

The aircraft developed by this company include the Hong-6 and the Yun-7. The Hong-6 is a medium-range, subsonic jet bomber; it can carry conventional bombs, special bombs or high-power bombs and launch attacks against enemy airfields and other military targets. This aircraft is equipped with modern navigation and radio communications equipment and is armed with a powerful defense system. It can also be used to carry out reconnaissance missions and to attack targets at sea. The Hong-6D is an improved version of the Hong-6. In addition to conventional bombs, this improved aircraft can also carry two air-to-ship missiles under its right wing and launch long-range attacks against targets at sea. Today, Hong-6D aircraft are being delivered to Chinese naval units.

The Yun-7 is a medium/short-range transport aircraft; it was approved by the state for production in July 1982 and delivered for commercial service in January 1984. In 1985, the Xi'an Aircraft Co. entered into a cooperative

agreement with the Hong Kong HAECO Co. to modify the radar, navigation and communications equipment of the aircraft. Also, the wingtip design was modified by this company to minimize induced drag and to reduce fuel consumption. The modified Yun-7 100 has improved safety, air worthiness and comfort. In terms of applications, there are three different models of the Yun-7: the passenger model, the passenger/cargo model, and the cargo model; it can also be used for geological exploration and aerial mapping. The Yun-7 aircraft has become the primary short-range passenger plane of Chinese civil aviation; today, there are 27 aircraft in service along more than 40 domestic routes.

The Xi'an Aircraft Co. was one of the first Chinese aviation enterprises to sign production contracts with foreign countries. Since 1979, it has signed contracts worth tens of millions of dollars with the Canadair Inc., the Boeing Co., Aeritalia, France's Aerospatiale, and the Airbus Industrie. Because of the high quality of products, the number of production orders from other countries has been increasing yearly. For example, it has signed a contract with the Boeing Co. to produce the vertical stabilizers for 200 Boeing 737 aircraft; delivery of the stabilizer began in 1988, and its quality fully met he specifications of U.S. standards.

In the area of applying military technology for economic construction, this company has developed and produced the 1.1-30-m microwave antenna base plates which had been widely used in airborne, shipborne and ground radars, microwave communication systems, satellite communication systems and receiving systems. The 4.5-m high-precision reflector antenna and the 6-m ground station antenna produced by this company are also widely used in this country.

Organization

Administratively, this company has a three-level management responsibility system; it is divided into 7 factories, more than 40 shops, and a design bureau and a process research bureau. It has a quality management office which applies the latest quality control techniques to control and improve product quality. In 1984 and 1985, the company received the quality management awards from Shanxi Province and from the Ministry of Aviation Industry respectively.

4. The Harbin Aircraft Manufacturing Corporation

Address: Harbin City
P.O. Box 201, Harbin City
Telephone: 62951
Cable: 2288
Telex: 87082 HAF CN

Overview

Established in February 1954, this company is one of the key enterprises of China's aviation industry; it is equipped with modern production facilities and has strong research and development capabilities.

The company is China's primary manufacturer of helicopters. In 1958, it developed the Soviet-designed Mi-4 helicopter, and began mass production after state certification in 1959. The rotor blades used on the early Mi-4 models were made of a composite metal tube/wood structure. In 1960, this company developed a rotor blade made of aluminum alloy with a honeycomb forged structure. The Mi-4 helicopter with the improved blades was renamed the Zhi-5.

The Zhi-5 has three different models: the passenger model, the aerial survey model and the sea rescue model. A total of more than 500 units were produced.

Based on the Zhi-5 design, the company also developed in cooperation with other organizations the Zhi-6 helicopter. The Zhi-6 had a newly designed fuselage and a 1,618-kW turbo-engine in place of the piston engine. It was flight tested in 1965, but did not go into production.

Currently, this company has imported a patent from France's Aerospatiale to build the "Dauphin" helicopter; it is named the Zhi-9. More than 20 Zhi-9's have been produced and delivered to commercial aviation organizations, military units and the Chinese Oceanic Helicopter Co.

This company has also developed a short takeoff and landing multi-role transport aircraft, the Y-11. This aircraft is primarily used in agriculture, forestry and geological exploration. The Y-12 aircraft, which was developed from the Y-11, has two different versions: I and II. The Y-12 I is powered by two PT6A-11 engines, each with a power rating of 500 hp; the Y-12 II is powered by two PT6A-27 engines, each with a power rating of 600 hp. In terms of applications, the Y-12 has four different models:

The short-range transport model. As a passenger plane, it can accommodate 17 seats; the cabin is well-lit and free from noise and vibration. As a cargo plane, the cabin floor has 11 anchor rings which can be used to secure cargo; the load capacity of the cargo deck is 750 kg/m^2.

The agricultural model. It can carry a 1,200-liter container filled with powder or liquid chemicals or fertilizers; it is capable of performing the missions of spraying chemicals, aerial seeding, fertilizing, creating artificial rain, killing insects, and detecting forest fires.

The geological exploration model. This aircraft can be equipped with a variety of detectors to explore metal resources, petroleum reserves and radioactive elements.

The military model. The Y-12 has a high wing design and a large cargo door which are particularly suited for parachute training and air drop operations. The cabin has bench seats which can accommodate 16 people.

The Y-12 can take off and land on either grass or dirt runways. Also, by installing special onboard equipment, it can be used to detect fish migration in the ocean and to take aerial photographs.

The non-aviation products of this company consist primarily of mini-size automobiles. The Songhua Jiang WJ110E, which is a twin-row mini passenger/cargo van, received 3 golden awards and 1 silver award in the 1987 national product quality contest. It also placed first among 14 competing manufacturers.

In recent years, the company has actively promoted international cooperation and explored production contracts with foreign companies. For example, it had signed contracts with British Aerospace, the U.S. Sikorsky Co. and Lockheed-Georgia to produce fuselage doors, center wing sections, landing gear doors, structural components, composite material parts, aircraft forged parts and hardened metallic alloy parts.

Organization

This company has implemented a general manager responsibility system. Reporting to the general manager are six assistant general managers who are in charge of design and technology, production and administration, material supply and post-sale service, planning, labor relations and finances, personnel, education and employee benefits. The company has seven factories which perform the functions of assembly, casting, forging, pressing, mechanical processing, heat treatment and riveting.

In addition, it also has a measurement center, a physical/chemical test center, a static test center, a computer center, and a digital processing center.

The aircraft design bureau has five offices: the design technology office, the aircraft structure office, the landing gear operation office, the engine development office, and the special research office.

5. The Shanghai Aviation Industrial Corporation

Address: Baibu Chiao, Wanping South Road, Xuhui District, Shanghai
P.O. Box 7840, Shanghai
Telephone: 383311
Telex: 33136 SHAIR CN

Overview

The Shanghai Aviation Industrial Corporation is a consortium of organizations which include the Shanghai Aircraft Manufacturing Factory, the Shanghai Aviation Engine Factory, and the Aircraft Design Institute.

1) The Shanghai Aircraft Manufacturing Factory

Address: 3115 Changzhong Road, Baoshan County, Shanghai
Telephone: 681122
Cable: 8503
Telex: 33136 SHAIR CN

Overview

This factory was established in 1951. Over the past decades, it had repaired, modified, and built dozens of different aircraft. In 1973, it became the Shanghai Aircraft Factory.

The factory has nearly 7,000 employees of which more than 1,000 are engineering and technical personnel. The factory occupies 1.35 million square meters of floor space of which 1.30 million square meters are used for production; it has a variety of modern processing equipment and test equipment.

In 1951, the factory was involved in the repair and modification of various aircraft; in 1958, it successfully developed the small seaplane, the "Feilong-1"; in 1959, it participated in the development of a weather rocket. In 1973, the factory underwent an expansion to accommodate the development of the large passenger plane, the Y-10. The prototype of the Y-10 passed its static test in November 1978, and the first flight test took place in 1980; the flight test results showed that the aircraft completely met the design requirements. On 31 July 1987, the first MD-82 aircraft assembled by this factory in cooperation with the McDonnel Douglas Corporation was delivered in Shanghai. Currently, the factory is continuing its efforts to assemble 25 MD-82 aircraft in accordance with the Sino-U.S. agreement.

In recent years, significant progress has been made by the factory in developing non-aviation products. An increasing number of commercial products with the "Double Wing" trade mark have appeared on the market. The Sf-650, 651, and 642 passenger vehicles are rolling off the production line, and they are found in every province and every city across the country; the total sales volume has reached 1,200 units. Production of the GX-4520 washing machine cannot keep up with demand. The BM-ES 315, 400 electric motors which are small, light-weight, and quiet, have been shown to meet U.S. military standards; they are widely used in the plastic molding industry and the shipping industry.

Organization

In addition to aviation-related departments such as plating, riveting, assembly, molding, and flight tests, the factory also has a commercial product development department.

2) The Shanghai Aviation Engine Manufacturing Factory

Address: 600 Guangzhong Road, Shanghai
P.O. Box 300, Shanghai
Telephone: 650644
Cable: 5834
Telex: 33136 SHAIR CN

Overview

This factory was established in 1972 primarily for developing aircraft engines for civil aviation. The factory

occupies 100,000 square meters of floor space of which 50,000 square meters are used for production. It has more than 2,000 employees, of which 360 are engineering and technical personnel. The factory has more than 500 pieces of mechanical processing equipment; specifically, it has a state-of-the-art digitally controlled processing center, digitally controlled milling machines, digitally controlled boring machines, ultra-precision grinding machines, and boring machines with different coordinate systems.

This factory has an "aviation engine sea-level open-air standard test facility" which is equipped with a computerized data collection and processing system. This facility has been used for performance evaluation of several Chinese-built engines. Its measurement accuracy is comparable to that of similar test facilities built by developed countries.

3) The Shanghai Aircraft Design Institute

Address: Longhua Airport, Shanghai
P.O. Box 7616, Shanghai
Telephone: 384811
Cable: 9045

Overview

Established in December 1973, the institute currently employs more than 600 technical personnel who directly participate in product design research and test. The institute designed the Y-10 medium/long-range passenger plane. The passenger cabin of the Y-10 can accommodate 178 seats based on an economy-class arrangement and 124 seats based on a mixed-class arrangement. The maximum takeoff weight of the Y-10 is 102 tons and the maximum payload is 21 tons; its cruising speed is 924 km/hr, and is range under maximum load is 3,150 km. In November 1978, the aircraft successfully passed the full-scale static test, and its maiden flight took place in September 1980. The aircraft had flown to the "roof of the world" Lasha seven times.

Based on the Y-10 design, the Shanghai Aircraft Design Institute has initiated the research and development of other models of the Y-10, which include an early-warning aircraft and a mid-air refueling aircraft. In addition, the institute is also cooperating with foreign countries to carry out technology research of a new propeller-fan aircraft.

China's 'Haiying-2A' Shore-to-Ship Missile Detailed

40080224 Beijing JIANCHUAN ZHISHI [NAVAL AND MERCHANT SHIPS] in Chinese No 6, 8 Jun 89 pp 8-9

[Article by Tang Zhongfan [0781 6988 5672]]

China's 'Haiying-2A' missile is one of the missiles developed by the China Precision Machinery Import-Export Company. It is a shore-to-ship missile equipped with an infrared terminal guidance system; because of its long range, high accuracy, and high destructive power, it is an excellent defensive weapon for protecting harbors and coastal cities. It is now deployed at many strategic locations along China's coast. This missile has the capability to sink or damage surface ships larger than a destroyer.

In addition to the development and sale of the "Haiying-2A" missile, the China Precision Machinery Import-Export Co. also develops and sells other naval missiles such as the "Haiying-2" shore-to-ship missile, the "Haiying-3" supersonic shore-to-ship missile, the "Haiying-4" anti-ship missile, the "C101" supersonic shore-to-ship missile, the "C301" supersonic anti-ship missile, the "C601" air-to-ship missile, the "C801" multi-role anti-ship missile, the "Red Flag-61" ship (surface)-to-air missile, and the "HN-5" shoulder-launched air-defense missile. Most of these missiles have been shown at a number of exhibits in this country and abroad in the form of actual hardware, scale models, or photographs.

Performance and Configuration

The "Haiying-2A" is often abbreviated as "HY-2A". The missile is 7.308 meters long, 0.76 meter in diameter, and its wing span is 2.40 meters. The missile stands 1.69 meters tall with the solid-propellant booster and 1.29 meters without the booster. The "Haiying-2A" weighs 2,990 kg, which includes the 570-kg solid booster and the 513-kg warhead.

The effective range of the missile is 20-95 km; its cruising altitude is 100 meters or 200 meters, and its cruising speed is 306 meters/sec. The missile is launched in a single-shot mode from less than 400 meters above sea level, and its hit probability is 70 percent.

The "Haiying-2A" resembles an aircraft; the missile body is aerodynamically designed. The nose section is an elliptical body of revolution, the tail section is a body of revolution generated by a second-order curve, and the mid-section is a cylinder. The wing, located in the mid-section, has a trapezoidal design with a flap at the trailing edge. It has three tail fins: a vertical tail fin and two horizontal tail fins; the angle between any two tail fins is 120°. Each tail fin is equipped with a control rudder. Below the missile body is a ventral fin which houses various conduits and cables.

Components of the guidance and control system, the warhead, the liquid-propellant rocket engine and the propellant tank are located inside the missile body.

The warhead components consist of the warhead, the fuse, the safety lock and the safety release mechanism. The warhead is a high-power armor-piercing warhead which is detonated by the fuse upon colliding with kthe target; its destructive power can penetrate the armor of any of today's warships. The explosion of the warhead can sink or severely damage a warship larger than a destroyer.

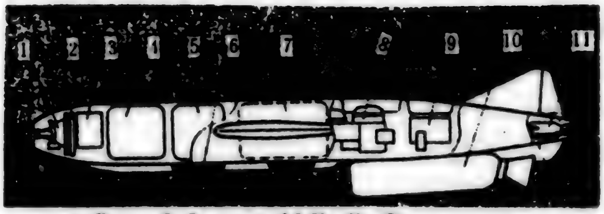

figure 2. Layout of Missile Components

Key: 1. Homing device of infrared terminal guidance 2., 6. Compressed-air bottle 3. Forward compartment of terminal-guidance homing device 4. Fuel tank 5. Warhead 7. Oxidizer tank 8. Controller of autopilot 9. Rear compartment of terminal-guidance homing device 10. Solid-propellant booster 11. Liguid-propellant engine

Beneath the tail section of the missile is a solid booster which can generate an enormous amount of thrust to propel the missile from the launcher. When the solid propellant is exhausted, the booster shell is released from the missile and falls back to the ocean.

The main engine of the "Haiying-2A" is a liquid-propellant rocket engine; this engine can provide variable thrust levels in response to the demand of each stage of the trajectory. Thrust control is accomplished by simply controlling the amount of fuel and oxidizer entering the rocket engine.

Infrared Terminal Guidance System

There are a number of ways to detect the presence of a ship; e.g. by detecting the electromagnetic waves reflected from the metallic structure of the ship; by capturing the image of a ship with a television camera; and by detecting the invisible infrared radiation emitted by the ship due to its heat content. Based on these physical principles, different homing devices have been developed: radar homing device, television-guided homing device, and infrared terminal-guidance homing device.

The "Haiying-2A" uses an infrared terminal-guidance homing device. It cannot be easily detected because it operates in a passive mode; it is also unaffected by electronic interference, interference caused by ocean waves and passive interference. The infrared emissions from the target ship are received by the missile and converted into control signals. These signals are used by the control system tol guide the missile toward the target.

Weapon System

The mechanized ground equipment of the "Haiying-2A" weapons system consist of various types of vehicles. In addition to the "Haiying-2A" missile, the system also includes the launch structure, the launch command vehicle, the power supply vehicle, the search and tracking radar vehicle, the infrared test vehicle, the fuel truck and the oxidizer truck. All these vehicles have good mobility.

The "Haiying-2A" is deployed over the launch site according to the specific needs of shore-line defense. Under combat conditions, the ground radar searches and tracks the target and sends the information to the missile before it is launched.

The "Haiying-2A" has an autonomous control system with automatic homing device. Once the missile is launched, it is no longer controlled from the ground; the missile follows an autonomous, pre-programmed flight trajectory. The effective range of the homing guidance system is 8-14 km. When the distance between the missile and the target is within this range, the homing device of the infrared terminal guidance system can be activated to control the missile flight until it hits the target.

Research on Mechanism of Interface Fracture in Carbon-Fiber-Reinforced Composites

40090078 Harbin HARBIN GONGYE DAXUE XUEBAO [JOURNAL OF HARBIN INSTITUTE OF TECHNOLOGY] in Chinese No 3, Jun 89 (manuscript received Jul 88) pp 89-94

[English abstract of article by Tao Xiaoqiu [7118 2556 4428] et al. of the Polymer Materials Laboratory]

[Text] The variation in ILSS (interlaminar shearing strength) of composites reinforced by carbon fiber—the surface of which was treated in different atmospheres of cold plasma—is studied. On the basis of ESCA [electron spectroscopy for chemical analysis], TG [thermogravimetric], DTA [differential thermal analysis] and laser Raman spectrum analyses, before and after treatment, a finding is presented that the interface fracture of a composite reinforced by carbon fiber was found mainly in the weak surface layer of the carbon fiber; but when the fiber surface was treated by O_2 plasma, the resistance of the fiber surface to shearing stress was raised, and the ILSS value of the composite was greatly increased.

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Multi-Lingual PC XT/AT Operating System Announced

40080215a Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 24, 21 Jun 89 p 13

[Article by Qian Yueliang [6929 6460 5328]: "Successful Development of a Multilingual Operating System"]

[Text] Laboratory No 2 of the Chinese Academy of Sciences' (CAS) Institute of Computing Technology recently developed MC-DOS, a multilingual operating system which can be used on PC XT/AT-type computers. The primary features of the system are:

1. It supports different language characters. MC-DOS can concurrently handle Chinese, Japanese (including kana and kanji), Italian, Russian, English, French, and German, as well as such languages as Spanish. Many other schemes could be used together with the support of this system.

2. It has an excellent user interface. The user interface for MC-DOS is basically the same as for CC-DOS. It provides various input methods. In the case of Japanese (including kana and kanji) and the Western-language input, besides providing the standard keyboard input method, it also provides a visual input method. For this reason, even people who do not understand foreign languages can enter text without undergoing special training.

3. It has excellent compatibility. This system is compatible with CC-DOS. Therefore, existing Chinese-character-based software (such as the Chinese-character WordStar and dBASE III) needs no modification to run on MC-DOS, and what is more, this software can now support the processing of many different languages. In addition, software developed by users and existing data need no modification whatsoever.

4. It has broad application possibilities. MC-DOS can be used in many departments. It can be used for natural-language processing (as for example in machine translation systems), by the publishing sector (such as for the editing and typesetting of Chinese and foreign-language books), and by libraries (the management of library information materials), as well as for cultural and economic exchanges with foreigners.

5. The system uses little system memory and is very responsive. Because it uses new techniques, MC-DOS greatly reduces the amount of memory required. Even supporting multiple orthographies, it occupies less space than does CC-DOS, and when entering Chinese characters, its response is quite a bit faster than that of CC-DOS.

The system is currently being tested on a limited scale. Reaction has everywhere been favorable, and the recommendation is to release it for use.

Problems Revealed in China's Software Market

40080215b Beijing RENMIN RIBAO in Chinese 8 Jul 89 p 5

[Article by Zhang Yanlin [1728 1750 2651]: "The Distorted Software Market"]

[Text] On the tide of the new-technology revolution, electronic computers have quietly worked their way into factories and mines, the countryside, and homes, and they are in widespread use by all sectors. According to preliminary statistics, the installed base of computers in China has reached 290,000 units, and it grows at an annual rate of 70,000 units.

The "soul" of the computer—software—is increasingly finding favor with users, and it is most likely to be a good selling product. However, a person of authority at the State Commission on Machine-Building's China Computer and Information Research & Development Center recently revealed that China's software market is getting more and more bleak, with no more than 20,000 pieces of domestically produced software being sold each year. There are more than 30,000 software technicians in China at present, but with only US$5 million in software export volume, China's exports are about the same as the Philippines', which has only about 1,000 software technicians.

Why should the software market be so abnormal? Is it a lack of supply of goods, or is there greater supply than demand?

The Desolate World of the Software Business

As this reporter stepped into the China Software Technology Company's (CSTC) Software Business Center, young Ni, who is in charge of sales, remarked, "The software business is really tough. This year, the 'Chinese-Character Input System' that we spent a half-year developing, and of which we thought we'd sell more than a thousand copies, stopped getting any inquiries after selling only 400 copies. Even more surprising, the software design aides we developed sold only two copies, after which we just locked them back up."

Other marketing units had the same sort of tragic tales. This reporter could not help asking at a software company, "Are there still technical problems to be overcome?" Several young people shook their heads, and all at once they came out with a stream of technical specifications, and went on to give me a demonstration of the "Naturally Coded Chinese-Character Input System," on which was written the following: "All who would buy the 'Naturally Coded Chinese-Character Input System' may first place a deposit of 40 yuan RMB (or proper credentials), and you may test the software for 1 month. When you are satisfied, pay the price, and if not satisfied, return the product to retrieve your deposit or credentials."

Even with this kind of knack for doing business, sellers in the software business have had a hard time being successful. Being unable to sell seriously affects the enthusiasm of the developers. The China Computer Systems Engineering Institute is a software development unit with abundant resources. Over the past few years, they have invested more than 500,000 RMB to painstakingly develop five editions of the CCDOS software series. After going on the market, they have sold only some 500 copies, which has just returned their costs. The institute director, Li Manjun [2621 2581 0193], said sadly, "How are we going to develop software products again?"

The Bustling "Knack of Doing Business"

Although the software market is very bleak, it still appears abnormally "bustling."

One computer company, mindless of cost, placed a full-page software ad in JISUANJI SHIJIE [CHINA COMPUTERWORLD].

At a marketing convention, a military command academy publicly sold repackaged software technology.

To build a name for its computer, one marketing department gave away pirated software for free.

To sell its products, one computer institute went so far as to give away software encryption and decryption materials, and even had compulsory encryption and decryption training sessions.

With such an active software market, what is reflected therein is a market image that is distorted and deranged.

Chen Chong [7115 3095], in charge of the software office of the State Commission on Machine-Building, said that the development and circulation of software has just begun to flourish in China, and the fact that we have not yet formulated final unified rules for the development, management, and use of software has given rise to certain difficulties in the circulation of software in markets, and has added a certain amount of confusion.

Li Jun [2621 6511], a systems engineer with CSTC, said that it is an important characteristic of software that it can be copied, and in this age of weak self-discipline and imperfect rules, there will be uncompensated copying and passing on or resale, from which phenomena arise "software pirates" and excessive encryption and decryption, all of which is abnormal.

At this point, Li Jun could not help but reply with a heavy heart that this freakish flourishing of the current software market should put us on our guard because this is not only conducive to the propagation of illegal activity, but is harmful to the rights of owners of intellectual property.

Placing Our Hopes on Law and Order

The bleak aspect currently presented by the software market in China is, after all, a reflection of a legal problem.

There are at present many countries in the world setting up rules and regulations for software. Following upon the 1976 revisions, in 1980 the United States Congress further amended the copyright laws, including computer software within the category of works of art, clearly using the copyright laws to protect the property rights of computer software. And some countries have used critical rights protection and exclusive legislation to safeguard the development and use of software.

Beginning in August 1985, China officially authorized 16 ministry commissions, such as those in the Ministry of Machine-Building and Electronics Industry, the Copyright Office, and the Patent Office, and 5 developed provinces and municipalities, such as Beijing and Shanghai, to raise money for the work of drafting software laws. As of this time, the draft has been changed three times, and it is hoped that before year's end it can be turned over to the Standing Committee of the National People's Congress for consideration.

And also many experts believe that sole reliance on the implementation of software law will still not be enough, and that we should use various channels to strengthen people's ideas about respecting knowledge and skills. On the one hand, we must educate people regarding use of law to protect their own legal rights, and on the other hand we must self-consciously respect the intellectual property of others, by which actions we will constitute the external environment for a just and harmonious market.

Others have recommended that we should strengthen the overall management of the software market, creating a single line that incorporates production, supply, and marketing to avoid duplicated development and low-grade cycles and highly difficult projects that are divorced from reality. Instead, we should use the system of economic law to evaluate the development and circulation of software.

New Super-Minicomputer About To Go Into Production

40080213a Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 22, 7 Jun 89 p 1

[Article by Chong Yi [1504 6146] and Neng Xing [5174 5887]: "The Domestically Produced SEK-2350/2360 Super-Minicomputer Is Quickly and Successfully Developed"]

[Text] On 16 May in Shenzhen the SEK-2350/2360 super-minicomputer, jointly developed by the Shenzhen Saige Computer Company and the Shenyang Institute of Computing Technology of the Chinese Academy of Sciences (CAS), passed the technical appraisal sponsored

by the Department of Computers at the Ministry of Machine-Building and Electronics Industry; the CAS Office of Technology, Science, and Development; and the Science the Technology Commission of Shenzhen City.

The technical appraisal commission broadly solicited the opinions of experts and representatives, and after earnest discussions and on-the-spot investigations, they resolved that the degree to which the SEK-2350/2360 computer system is produced in China is high: aside from the CPU and main-memory boards, all the host board components are made in China. The performance of the Institute-developed two-layer printed circuit boards is good, the thermal design of the power-supply components and of the entire machine is of a high standard, and the entire machine effortlessly passed the 35 degrees (for 10 hours) heat upper-limit check and the 1,250-volt high-voltage impulse safety check. After test calculations and reliability operations checks, system performance was seen to be stable and reliable. The system is compatible with the internationally popular VAX 3500/3600 super-minicomputers and technically it meets advanced standards of current international products of the same type. Its successful development is yet another major S&T achievement for China's computer industry during the Seventh 5-Year Plan.

With close cooperation between the Shenzhen Saige Computer Company and the CAS Shenyang Computing Institute, the development effort for this computer took only 5 months, and this plan was worked out jointly by enterprises in the special economic zone and interior scientific research units to provide the experience with which to absorb and assimilate advanced foreign technology, and to effectively keep up with foreign advances in high technology.

The appraisal committee expressed its hope that the concerted efforts of the systems development, applications development, and associated units can continue to improve the degree of China's participation, to enhance system performance, to hasten the development and porting of various applications systems, and to strengthen training and service efforts. They also recommended that state leadership organs and pertinent departments continue to support these efforts, to quickly arrange for small-batch production so that it might be put on the market, disseminated, and put into use as quickly as possible.

PLA Unit Develops Software

40080213b Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 22, 7 Jun 89 p 2

[Article by Bu Shenghuai [5943 5116 2037]: "The Command & Control Lab of a Certain PLA Unit Actively Develops Computer Software"]

[Text] The headquarters of a PLA unit stationed in Henan has energetically met the needs for building up the unit's command & control automation, and over the past 2 years has developed 15 pieces of software for minicomputers and microcomputers, among which software five have been awarded prizes both within the military and outside. Currently, this software is being used in dozens of fields such as combat command, deployment, equipment, communications, finances, and records management.

To change the situation in which the microcomputers of the organization could only be used to type out documents, to therefore enable the computers to truly serve the mission of automation, a thorough survey was done of four systems in that unit: military affairs, political affairs, logistics, and technology and arms. From this were derived nearly 100 projects that needed implementation, and they concentrated their manpower and supplies on the development and dissemination of more than 10 valuable vanguard projects. The software that was developed is all characterized by being quite useful, easy to use, highly efficient, and valuable for dissemination. For example, the "Communications Duty Information Management System" has many functions, can concurrently handle more than 10,000 pieces of data, and can automatically generate and print various standard reports at efficiency more than 240 times that done manually.

Warship Damage Control Simulator Proves Successful

40080213c Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 22, 7 Jun 89 p 2

[Article by Xu Sen [6079 2773]: "Test Is Successful for Warship Damage Control Training Simulator"]

[Text] The "Warship Damage Control Training Simulator" developed at the Naval Engineering Institute recently underwent successful training testing.

This simulator is primarily for use in training the warship (or boat) ship's captain, electromechanics officers, and officers of other departments, as well as relevant specialist students to be able to carry out damage-control activities when there is ship damage (damage from shell hits, cabin flooding, and fires).

This simulator consists of a microcomputer system, destroyer model and monitoring system, control platform, damage-situation display, and a command position. The computer must be able to promptly reflect the buoyancy status and stability for the entire ship and for single or multiple chambers after damage and flooding, and to provide accurate numbers and the necessary diagrams for the results of adjustments and handling.

The cabin module must be able to realistically portray situations during normal conditions, conditions in adjoining chambers after damage and flooding, and after repairs, and it must automatically plot curves for flotation and stability conditions.

During the simulation tests the students could clearly see the simulated display of the computer-controlled ship model flooding and being bailed, the fire-fighting pipe routes, and the electrical network and oil and water systems; this allowed the trainees to become familiar with damage-control command principles and with the command principles for a rapid sinking, and to thoroughly understand the capacity of a ship to avoid sinking, so that if they should encounter the real danger, they would be able to correct direct anti-sinking measures for the ship, reducing or avoiding serious damage.

Following up on this warship damage-control training simulator, the academy has recently again been first to develop a "submarine anti-sinking training simulator." In addition to being able to train on land captains of conventional and nuclear submarines, power officers, and specialists in various technical commands how to handle ship damage and flooding, and how to organize and command the actual capacities for submarine sinking prevention and operations, the "submarine anti-sinking preparedness plan" software they developed at the same time as the simulator can test and verify the anti-sinking properties of various new submarines, and can select the optimum anti-sinking preparedness plan. After improvement, this can provide feasible research to prevention and rescue departments in working up preparedness plans for warships and submarines.

Minicomputer Graphics Software Adds Chinese Characters

40080213d Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 22, 7 Jun 89 p 16

[Article by Li Ying [2621 5391]: "Four Achievements from the University of S&T for National Defense's Electronics Technology Department Pass Evaluations"]

[Text] Four products developed by the University of Science & Technology for National Defense (USTND) Electronics Technology Department, Teaching and Research Section No. 405—the HS-10 General-Purpose High-Speed Processing Unit, the GDK-450 Vector Chinese-Character Library, the PLOT-10-GKS Graphics Software Package with Expanded Chinese-Character Functions, and the GKD-PROGKS Graphics System—have passed their technical appraisal in Changsha.

The HS-10 is a general-purpose accelerator processing unit for use with the 86/300 series of microcomputers successfully developed by USTND. This unit uses the TMS3210 LSI processing chip, two address generators, 4K bytes of dual-port program memory and 32K of dual-port data memory, as well as a reciprocal divider, and it is characterized by flexible and convenient programming, powerful development functions, high processing speed, and reasonable price. The average processing rate is 1-2 orders of magnitude higher than that of the 86/300 microcomputer, and—especially because of the assembly programs, macro assembly programs, and work files developed for the HS-10—the unit provides a powerful tool for developing HS-10 applications software on the Intel 86/300 series of microcomputers. The HS-10 has a high dissemination and application value for scientific and mathematical calculations, graphics/image processing, measurement analysis, digital signal processing, and high-speed measurement control.

The GKD-405 vector Chinese-character library is made up of the 15X16 dot-matrix library of level 1 and 2 Chinese characters and symbols as defined in the "Coded Character Set for Information Exchange Using Chinese Characters" basic set (GB-2312-80), and as transformed into a vector library. The contents of the levels 1 and 2 vector Chinese-character library are complete, each Chinese character and symbol is drawn accurately, fonts are alterable and attractive, and they take up little room, and are easy and quick to retrieve. This kind of vectored Chinese-character library is being used in the "PLOT-10-GKS expanded Chinese-character-functions" system, where the results are excellent and can be used in various graphics systems.

The PLOT-10-GKS is a graphics software package based on imported software that runs on VAXes and that has the 2B level GKS [graphics kernel system] functions. After analyzing the PLOT-10-GKS, researchers expanded the Chinese-character output functions, in accordance with the international GKS requirements, onto PLOT-10-GKS text and graphics originals, providing the levels 1 and 2 vector Chinese-character libraries at the system level. PLOT-10-GKS that has been extended Chinese-character output functions both preserves the original PLOT-10-GKS complete functions, and also can output GB2312-80 levels 1 and 2 Chinese character text on text and graphics originals. Outputting Chinese character text is the same as outputting Western text, as it is controlled by the various text attributes defined for the GKS standard. Chinese character text an be kept together with Western text in graphics segment and primitives files, and can be exchanged and transmitted together with other graphics.

The GKD-PROGKS graphics system is a large graphics system running under the support of the VAX/VMS operating system. This system blends the GKD-PROLOG/VAX and the PLOT-10-GKS graphics software with extended Chinese-character functions. The entire system occupies 1.3 megabytes in the MAP graphic. This unified system uses the Prolog language for its man-machine interface: it can run in the Prolog programming mode, and can also run single-step with Prolog interactively. In addition to the original Prolog-system predicates, 224 graphics predicates have been newly written for the complete system, by which means can be realized graphics functions equivalent to the international GKS 2B standard. In addition, Chinese-character output functions have been added. This system resolves well the series of technical difficulties that include linking to the Pascal and FORTRAN environments, conversion of data structures between Prolog and

GKS, and the bidirectional transfer of parameters. Because of painstaking design of data structures and use of advanced algorithms, this system runs very quickly while preserving the original Prolog system and GKS graphics package features. This project can be used to support high-technology project research in intelligent systems, and can also support the various applications systems that are currently based on Prolog mechanisms.

New Series of Microcomputers To Appear in Zhejiang

40080209a Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 23, 14 Jun 89 p 1

[Article by Huang Xiao [7806 2556]: "The China Magnetic Recording Equipment Company Formally Announces the ERGO Series of Microcomputers"]

[Text] In Hangzhou on 23 May, the China Magnetic Recording Equipment Company (CMREC) formally introduced to all sectors of society its ERGO series of microcomputers, jointly developed and manufactured with the ERGO [Yigao 5669 7559] Computers Co., Ltd., of Hong Kong.

The Hong Kong ERGO Company, Ltd., is CMREC's largest holding company in Hong Kong, and it is exclusively engaged in designing and manufacturing high-quality microcomputer products, which are sold throughout the world in more than 20 nations and areas. The products being promoted at this time are Chinese-produced microcomputers; they have the technical support of the ERGO Computer Company but are domestically manufactured. There are two grades, the ERGO 286 and the ERGO 0520, in six models.

The ERGO 286DH has an 80286 CPU with master clock speed of 8-12 MHz and on-board internal memory of 1 megabyte, expandable to 4 megabytes. It is equipped with two 5.25-inch floppy disks (one 360K bytes and one 1.2 megabytes), two 3.5-inch 40-megabyte hard disks, and a 14-inch high-resolution color monitor (648X504). This machine is highly compatible with the Great Wall computers.

The ERGO 286DH-2 has an 80286 CPU with master clock speed of 8-12 MHz and internal memory of 2 megabytes, expandable to 4 megabytes. It is equipped with two 5.25-inch floppy disks (one 360K bytes and one 1.2 megabytes), two 3.5-inch 40-megabit hard disks, and a 14-inch super-high-resolution automatic-tracking color monitor (800X600), which can provide high-quality graphics displays. A hardware Chinese-character card is included.

The ERGO 286AM system is configured essentially the same as the 286DH, except that it comes with a 12-inch high-resolution monochrome display (720X350). It has high resolution and a low price.

The ERGO 0520BM uses the 16-bit 8088-2 for its CPU, with a master clock speed in the range 4.77-10 MHz and internal memory of 640K bytes. It is equipped with two 360K-byte 5.25-inch floppy disks and a 12-inch high-resolution monochrome display (720X350).

The ERGO 0520CM is built on the basis of the 0520BM, but has been expanded to include a 3.5-inch 30-megabyte hard disk.

The ERGO 0520CH-2 system is configured similarly to the 0520CM, but comes with a 14-inch high-resolution color display. The strong point of this machine is its Chinese-character functions.

A shared feature among the ERGO series of computers is their speed, as all use the fastest CPUs and switchable (dual-selection) master clock speeds, as well as 3.5-inch high-speech Winchester disks. They have large internal and external storage capacities, advanced structure, and use the newest gate-array technologies and surface-mounting techniques. They offer various kinds of display modes. These series also have powerful Chinese-character processing capabilities, and they are highly compatible with both domestic and foreign mainstream computers. There is abundant system software and support software, the computers are nicely styled, and the price is lower than that for foreign machines of a similar quality. These series can meet the different demands of different specialties, and at all levels. It is believed that during the Eighth 5-Year Plan, the ERGO series of computers will account for one-tenth the Chinese domestic production of microcomputers. At the "Zhejiang Provincial Enterprises' Conference on the Effort of Managing and Applying Microcomputers," participants recommended the ERGO series of microcomputers to all enterprises throughout the province. This company will first set up a maintenance network in municipalities and prefectures in all areas throughout the province, which will gradually extend throughout the country.

More Work Urged for Bubble-Memory Development

40080189a Beijing ZHONGGUO DIANZI BAO in Chinese 9 May 89 p 3

[Article by Qing Feng [7230 1496] and Liu Zengmin [0491 1073 3046]: "Experts Discuss Prospects for Bubble-Memory Technology"]

[Text] Should we continue to make provisions for developing bubble-memory technology during the Eighth 5-Year Plan? This subject was discussed fully at a conference held recently by the Department of Microelectronics and Basic Products under the Ministry of Machine-Building and Electronics Industry.

The magnetic bubble memory is a large-capacity, nonvolatile, all-solid-state magnetic storage, the basic technology behind which is to epitaxially grow magnetic single-crystal thin film on a gadolinium gallium garnet substrate. Using LSI techniques, one can make magnetic bubble circuits that can perform various functions.

The experts stated that at present, although there are such storage and recording systems as magnetic tape, magnetic disks, magnetic drums, and semiconductors, when compared with the magnetic bubble memory, the latter has several outstanding characteristics, primary among which are simplicity and reliability, radiation resistance, high capacity for endurance in harsh environments, permanent retention, and an absence of mechanically rotating devices. Therefore, it has obvious advantages over other storage and recording technologies when used for storage and recording applications in such situations as nuclear testing, on missiles, and on aircraft. In addition, it has value in its broad applications to civilian equipment (such as telephone exchanges, numerically controlled machine tools, and precision meters). Therefore, it is necessary to continue developing this memory technology.

The bubble memory has developed quickly since its introduction abroad in 1967. Production and real applications began in 1977, capacities have expanded from 64 Kbits to 4 Mbits, and now there are even 16 Mbit devices, with 64-Mbit devices currently under development. After 10 years of hard work, the foundation for the development of bubble-memory technology in China has been laid. This foundation extends from materials and devices to applications; under it, an S&T contingent has been trained to a significant level. These specialists have completed research on 64-100-Kbit devices,and during the year before last and last year, respectively, made mask plates for 256-Kbit and 1-Mbit bubble-memory chips; they have begun work on limited applications of integrated systems, and have made great advances in the basic research on the Bloch linear bubble memory. But in their overall view, the experts felt that our research capacities are too weak, our level of technology is too low, and application aspects are yet to be explored.

At the conference, the experts recommemded that we should include bubble-memory devices among key tasking for the Eighth 5-Year Plan, that we should continue to invest research, production capacity, and funds at appropriate scales, and that we should undertake technology transformation of existing equipment and clean-room conditions. We should more quickly develop this technology so that it might serve the national economy.

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